UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

IN THE MATTER OF: BASF Corporation 1609 Biddle Avenue Wyandotte, Michigan 48192 USEPA ID NO.: MID 064 197 742 RESPONDENT	)	ADMINISTRATIVE ORDER ON CONSENT USEPA DOCKET NO.: V-W- 011 '94 Proceeding under Section 3008(h) of the Resource Conservation and Recovery Act of 1976, as amended, 42 U.S.C. §6928(h).

I. JURISDICTION

This ADMINISTRATIVE ORDER ON CONSENT (Consent Order) is issued pursuant to the authority vested in the Administrator of the United States Environmental Protection Agency (U.S. EPA) by Section 3008(h) of the Solid Waste Disposal Act, commonly referred to as the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. §6928(h). The authority vested in the Administrator to issue Orders under §3008(h) of RCRA has been delegated to the Regional Administrator in Region V and has been further delegated to the Director of the Waste Management Division (Waste Management Division Director) by U.S. EPA Delegation Nos. 8-31 and 8-32, dated April 16, 1985, and May 15, 1986, respectively.

This Consent Order is issued to BASF Corporation (Respondent), the owner and operator of the BASF North Works facility at 1609 Biddle Avenue, Wyandotte, Michigan 48192 (the Facility). Respondent consents to and agrees not to contest U.S. EPA's jurisdiction to issue this Consent Order and to enforce its terms. Further, Respondent will not contest U.S. EPA's jurisdiction to:

compel compliance with this Consent Order in any subsequent enforcement proceedings, either administrative or judicial; require Respondent's full or interim compliance with the terms of this Consent Order; or impose sanctions for violations of this Consent Order.

II. DEFINITIONS

Unless otherwise expressly provided herein, terms used in this Consent Order which are defined in RCRA or in regulations promulgated under RCRA shall have the definitions given to them in RCRA or in such regulations.

1. Acceptable, in the phrase "In a manner acceptable to U.S. EPA..." shall mean that submittals or completed work meet the terms and conditions of this Consent Order, Attachments, Scopes of Work, approved Workplans and/or U.S. EPA's written comments and guidance documents.

2. Additional work shall mean any activity or requirement that is not expressly covered by this Consent Order or its Attachments but is determined by U.S. EPA to be necessary to fulfill the purposes of this Consent Order as presented in Section III: Statement of Purpose.

3. Administrative Record shall mean the record compiled and maintained by U.S. EPA supporting this Consent Order. For information on the contents of the Administrative Record see "Guidance on Administrative Records for RCRA 3008(h) Actions," OSWER Directive 9940.4, July 6, 1989.

4. Area of Concern shall mean any area of the Facility under the control or ownership of the owner or operator where a release to the environment of hazardous waste(s) or hazardous constituents has occurred, is suspected to have occurred, or may occur, regardless of the frequency or duration of the release.

5. CERCLA shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§9601, et seq.

6. Comply or compliance may be used interchangeably and shall mean completion of work required by this Consent Order of a quality approvable by U.S. EPA and in the manner and time specified in this Consent Order or any modification thereof, its attachments or any modification thereof, or written EPA directives. Respondent must meet both the quality and timeliness components of a particular requirement to be considered in compliance with the terms and conditions of this Consent Order.

7. Contractor shall include any subcontractor, independent contractor, consultant or laboratory retained to conduct or monitor any portion of the work performed pursuant to this Consent Order.

8. Corrective measures shall mean those measures or actions necessary to control, prevent, or mitigate the release or potential release of hazardous waste or hazardous constituents into the environment.

9. Corrective Measures Implementation or CMI shall mean those activities necessary to initiate, complete, monitor, and maintain the remedies U.S. EPA has selected or may select to protect human health and/or the environment from the release or potential release of hazardous wastes, or hazardous constituents, into the environment from the Facility. [The CMI requirements are detailed in the CMI Scope of Work included as Attachment IV.]

10. Corrective Measures Study or CMS shall mean the investigation and evaluation of potential remedies which will protect human health and/or the environment from the release or potential release of hazardous wastes, or hazardous constituents, into the environment from the Facility. [The CMS requirements are detailed in the CMS Scope of Work included as Attachment III.]

11. Data Quality Objectives shall mean the qualitative or quantitative statements, the application of which is designed to ensure that data of known and appropriate quality are obtained.

12. Day shall mean a calendar day unless expressly stated to be a business day. Business day shall mean a day other than a Saturday, Sunday, or Federal Holiday. In computing any period of time under this Order, where the last day would fall on a Saturday, Sunday, or Federal Holiday, the period shall run until the end of the next business day.

13. EPA or U.S. EPA shall mean the United States Environmental Protection Agency, and any successor Departments or Agencies of the United States.

14. Facility shall mean all contiguous property under the control of the owner and/or operator.

15. Hazardous Constituents shall mean those constituents listed in Appendix VIII to 40 C.F.R. Part 261 or any constituent identified in Appendix IX to 40 C.F.R. Part 264.

16. Hazardous Waste shall mean hazardous waste as defined in §1004(5) of RCRA or 40 C.F.R 260.10. This term includes hazardous constituents as defined above.

17. Innovative Treatment Technologies shall mean those technologies for treatment of soil, sediment, sludge, and debris other than incineration or solidification/ stabilization and those technologies for treatment of groundwater contamination that are alternatives to pump and treat. Pump and treat in this instance refers to pumping with conventional treatments like air stripping and UV oxidation.

18. Interim measures or IM shall mean those actions, which can be initiated in advance of implementation of the final corrective action for a facility, to achieve the goal of stabilization. Interim Measures initiate cleanup at a facility and control or eliminate the release or potential release of hazardous wastes or hazardous constituents at or from the Facility.

19. Receptors shall mean those humans, animals, or plants and their habitats which are or may be affected by releases of hazardous waste or hazardous constituents from or at the Facility.

20. RCRA Facility Investigation or RFI shall mean the investigation and characterization of the source(s) of contamination and the nature, extent, direction, rate, movement, and concentration of the source(s) of contamination and releases of hazardous waste, including hazardous constituents, that have been or are likely to be released into the environment from the Facility. [The activities required for the RFI are detailed in the RFI Scope of Work included as Attachment I.]

21. Solid Waste Management Unit or SWMU shall mean any discernible unit at which solid wastes have been placed at any time irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a Facility where solid wastes have been routinely and systematically released.

22. Scope of Work or SOW shall mean the outline of work Respondent must use to develop all workplans and reports required by this Order as set forth in this Consent Order and its Attachments I, II, III, IV, V and VI. All SOW Attachments and modifications or amendments thereto, are incorporated into this Consent Order and are an enforceable part of this Consent Order.

23. Stabilization shall mean the goal or philosophy of controlling or abating immediate threats to human health and/or the environment from releases and/or preventing or minimizing the spread of contaminants while long-term corrective measures alternatives are being evaluated.

24. Submittal shall include any workplan, report, progress report, or any other written document Respondent is required by this Consent Order to send to U.S. EPA.

25. Violations of this Consent Order shall mean those actions or omissions, failures or refusals to act by Respondent that result in a failure to meet the terms and conditions of this Order or its Attachments.

26. Work or Obligation shall mean any activity Respondent must perform to comply with the requirements of this Consent Order and its Attachments.

27. Workplan shall mean the detailed plans prepared by Respondent to satisfy the requirements of the corresponding Scope of Work. The requirements for each workplan are presented in Section VII: Work to be Performed and the Attachments I, II, III, IV, V and VI.

III. PARTIES BOUND

A. This Consent Order shall apply to and be binding upon U.S. EPA, Respondent and its officers, directors, employees, agents, and successors and assigns, heirs, trustees, receivers, and upon all persons, including but not limited to contractors, subcontractors, independent contractors, laboratories and consultants acting on behalf of the Respondent.

B. No change in ownership or corporate or partnership status relating to the Facility will in any way alter Respondent's responsibility under this Consent Order. Any conveyance of title, easement, or other interest in the Facility, or a portion of the Facility, shall not affect Respondent's obligations under this Consent Order. Respondent will be responsible and liable for any failure to carry out all activities required of Respondent by the terms and conditions of this Consent Order, regardless of Respondent's use of employees, agents, contractors, or consultants, to perform any such tasks.

C. Respondent shall provide a copy of this Consent Order to all contractors, subcontractors, independent contractors, laboratories, and consultants retained to conduct or monitor any portion of the work performed pursuant to this Consent Order within 14 days of the effective date of this Consent Order or date of such retention, and shall condition all such contracts on compliance with the terms of this Consent Order.

D. Respondent shall give written notice of this Consent Order to any successor in interest prior to transfer of ownership or operation of the Facility, or a portion thereof, and shall notify U.S. EPA no later than ninety (90) days prior to such scheduled transfer.

E. Respondent agrees to undertake all actions required by the terms and conditions of this Consent Order, including any portions of this Consent Order incorporated by reference.

IV. STATEMENT OF PURPOSE

In entering into this Consent Order, the mutual objectives of the U.S. EPA and BASF Corporation are: (1) to continue to take measures to prevent the flow of contaminated groundwater from the Facility to the Detroit River and the Wayne County Department of Public Works sewerage system (except as provided by permit), and to perform any other Interim Measures (IM) at the Facility which may be deemed necessary under this Consent Order to relieve threats to human health or the environment; (2) to prepare a RCRA Facility Investigation (RFI) workplan, perform the RFI to determine fully the nature and extent of any release of hazardous wastes and hazardous constituents at or from the Facility, and prepare an RFI Report; (3) to prepare a Corrective Measures Study (CMS) workplan, propose corrective action objectives and protection standards, perform a CMS to identify and evaluate alternatives for the corrective action necessary to prevent or mitigate any migration or releases of hazardous wastes or hazardous constituents at or from the Facility consistent with corrective action objectives and protection standards, and prepare a CMS Report; and (4), if deemed necessary by U.S. EPA, to prepare a Corrective Measures Implementation (CMI) workplan, implement the corrective measure or measures selected by the U.S. EPA at the Facility, and prepare a CMI Report.

V. FINDINGS OF FACT

A. Respondent is a company doing business in the State of Michigan, whose registered agent in the State of Michigan is The Corporation Company, 615 Griswold Street, Detroit, Michigan, 48226 [Ref: Mich. Dept. of Commerce]. The Respondent is a person as defined in Section 1004(15) of RCRA, 42 U.S.C. §6903(15) and 40 CFR 260.10.

B. Respondent is the owner and operator of a facility located at 1609 Biddle Avenue, Wyandotte, Michigan. Respondent and its predecessor, BASF Wyandotte Corporation, have engaged in storage of hazardous waste at the Facility subject to interim status requirements, 40 CFR Part 265. Hazardous waste management activities of the Respondent and BASF Wyandotte Corporation have included (1) storage of up to 25,300 gallons and 100 cubic yards of hazardous waste in containers; and (2) storage of hazardous waste in a 4,000 gallon tank.

C. The Facility was owned and operated by BASF Wyandotte Corporation as a hazardous waste management facility on and after November 19, 1980, the applicable date which renders facilities subject to interim status requirements or the requirement to have a permit under Sections 3004 and 3005 of RCRA, 42 U.S.C. §§6924 and 6925.

D. (1) Pursuant to Section 3010 of RCRA, 42 U.S.C. §6930, BASF Wyandotte Corporation notified U.S. EPA of its hazardous waste activity. In its notification dated August 5, 1980, BASF Wyandotte Corporation identified itself as a generator of hazardous waste and an owner/operator of a treatment, storage, and disposal facility for hazardous waste.

(2) On December 31, 1985, BASF Wyandotte Corporation was merged into BASF Inmont Corporation and simultaneously the name of the surviving corporation was changed to BASF Corporation. In a letter dated November 27, 1985, BASF Wyandotte Corporation provided notice to U.S. EPA of this change in corporate status.

E. (1) On November 17, 1980, BASF Wyandotte Corporation submitted an initial Part A permit application as required by Section 3005(a) of RCRA, 42 U.S.C. §6925(a).

(2) In revisions to its initial Part A permit application, BASF Wyandotte Corporation deleted application for treatment of hazardous waste in a surface impoundment, and added and subsequently deleted application for treatment of hazardous waste in an incinerator.

(3) In revisions to its Part A permit application, dated June 25, 1981, BASF Wyandotte Corporation identified itself as managing the following hazardous wastes at the Facility:

(a) Wastes exhibiting the characteristic of ignitability as defined in 40 CFR 261.21 (EPA hazardous waste number D001).

(b) Wastes exhibiting the characteristic of corrosivity as defined in 40 CFR 261.22 (EPA hazardous waste number D002).

(c) Hazardous wastes from non-specific sources (40 CFR 261.31): spent halogenated solvents which may include more than one of the following (EPA hazardous waste number F002):

tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and still bottoms from the recovery of these solvents.

spent non-halogenated solvents which may include more than one of the following (EPA hazardous waste number F003):

xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, methanol, and still bottoms from the recovery of these solvents.

spent non-halogenated solvents which may include more than one of the following (EPA hazardous waste number F005):

toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, 2-nitropropane, and still bottoms from the recovery of these solvents.

(d) Commercial chemical product hazardous wastes:

acrylonitrile (EPA hazardous waste number U009), chlorobenzene (EPA hazardous waste number U037), chloroform (EPA hazardous waste number U044), and tetrachloromethane (EPA hazardous waste number U211).

F. Respondent's Facility is described as follows:

(1) Commonly referred to as the "BASF North Works", occupying approximately 230 acres, located in the City of Wyandotte, Wayne County, State of Michigan, part of fractional Sections 21 and 28, T. 3 S., R. 11 E., and generally described as being bounded on the north by Perry Place, on the east by the Detroit River, on the south by Mulberry Street, and on the west by Biddle Avenue.

(2) According to correspondence and submissions to U.S. EPA, while owned and operated by the Respondent or BASF Wyandotte Corporation, the Facility engaged in the manufacture, and conducted research and pilot activities in support of its manufacturing, of industrial inorganic chemicals, polyether polyol resins, polyurethane plastics and castings, and vitamins A and E. Historical activities at the Facility have included the manufacture of soda ash and coke.

(3) No fewer than nine solid waste management units have existed at the facility, including: a nominal 25,300 gallon capacity outdoor container storage area; a nominal 100 cubic yard capacity outdoor container storage area; a portion of a warehouse near Alkali Street; a 4,000 gallon capacity above ground storage tank; a nominal 2,000,000 gallon per day wastewater treatment surface impoundment, and three nominal land disposal units.

(a) The nominal 25,300 gallon capacity container storage area is the 75 foot by 75 foot southwest portion of a 100 foot by 178 foot concrete pad, located on the west side of the facility slightly northeast of the research and development complex. The container storage area has a 3 foot square by 2 foot deep sump on its west side, and is enclosed on three sides by a 6 inch high by 4 inch wide curbing. Wastes managed in the area have included those designated by hazardous waste numbers:

D001, D002, D003, F001, F002, F003, F005, U009, U037, U044, U121, U210, U221, U223, 123U, 131U, 019L, 020L, 021L, 025L, and 029L [Ref: Closure Document].

On June 27, 1991, the Michigan Department of Natural Resources (MDNR) recognized the status of the container storage area as closed. However, because of soil and groundwater chemical contamination identified in a June 1981 MDNR investigation, the MDNR denied a determination of clean closure.

(b) The nominal 100 cubic yard capacity container storage area is an outdoor 6.5 foot by 26 foot concrete pad located on the west side of the Facility adjacent to a storage building near the research and development complex. The Facility has used this area for less than 90 day accumulation of hazardous wastes, typically consisting of waste solvents from non-specific sources and ignitable wastes, generated exclusively from chemical research, engineering, and analytical activities.

(c) The warehouse located inside building 53M west of Chippewa Street has been used from August 1, 1983, until June 22, 1992, for the accumulation of hazardous wastes for less than 90 days [Ref: Closure Document p.7, BASF Letter of November 5, 1993].

(d) The 4,000 gallon capacity tank is an above ground, in-line component of the Facility's vitamin E manufacturing process, that was previously used to accumulate acetic acid generated primarily as a manufacturing by-product, and is currently used for the storage of heptane, a manufacturing raw material. The acetic acid was not contaminated with other residual chemical constituents to the extent that it was inherently waste like, such that the Facility typically was able to sell the material for "as received" use in cement processing. On no fewer than four occasions since the tank became regulated under RCRA, when a buyer for the acetic acid was unavailable, the acetic acid was manifested as a hazardous waste and transported for off-site neutralization and disposal. Since November 1987, the tank has been connected by pipe to a treatment vessel, such that when a buyer for the acetic acid was unavailable, the acetic acid was neutralized and discharged to a sanitary sewer as wastewater [Ref: Closure Document p.5, BASF letter of November 5, 1993].

(e) The nominal 2,000,000 gallon per day surface impoundment, located near the north end of the Facility, is used to treat only wastewater that is not regulated as a hazardous waste pursuant to RCRA.

(f) The nominal land disposal unit, located in an elevated area southwest of the coal pile (Ref: 1983 Complaint), used for the disposal of waste filter cake generated in the polyol manufacturing process.

(g) The two nominal waste pile units, located "on the south end of [the Facility] and are just west of the large brine storage pond" [Ref: Ibid.]. These SWMUs have been used for the storage of demolition rubble.

(h) The emergency containment pond located near the intersection of Wyandotte Road and Huron Road used to treat wastewater runoff.

(4) From information developed during a June 1981 MDNR investigation and information developed by Respondent between December 1991 and September 1992, the following Areas of Concern (AOC) have been identified:

(a) AOC 1 is "an open area just south of the polyol process facility" [Ref: 1983 Complaint].

(b) AOC 2 is "the old coke production and bi-products [sic] area, and is just east of [AOC 1]" [Ref: Ibid.].

(c) AOC 3 is an area southeast of the intersection of Wyandotte Road and Ottawa Road.

(5) The eastern half to two-thirds of the Facility is reclaimed marshlands and riverbottom, filled to bring the site to approximate present grade with a heterogeneous mixture of cinders; crushed limestone sand, gravel and cobbles; coal, bank sand, and gravel; clay; and wood timbers, broken concrete and bricks. The fill material occupies the full length of the Facility in a wedge up to 22 feet in thickness which begins near Biddle Avenue and extends to the Detroit River, about 1000 feet in width on the north boundary to about 2400 feet in width across the center of the Facility. The land surface, consisting of fill materials, is separated from the Detroit River by a dock area extending from the northeast corner of the facility to a point approximately 850 feet north of the southeast corner of the facility. Natural materials underlying the fill are glacial and post-glacial deposits, mostly lacustrine clay which ranges in approximate thickness from 40 to 70 feet and fluvial sand which fills depressions and cavities in the lacustrine clay. Soft, organic materials such as peat and organic clay overlie the lacustrine clay and fluvial sand in many places, with typical thicknesses of less than 2 feet. Glacial deposits in the region are underlain by dolomite bedrock at typical depths of between 50 and 100 feet. Groundwater in the dolomite contains large amounts of sulfide, causing it to be non-potable [Ref: S.S. Papadopulos, 1984].

(6) The surficial fill, fluvial sand, and peat make up the uppermost hydrogeologic system at the Facility. This system has undetermined hydraulic communication with hydrogeologic systems beyond the Facility boundary. The low permeability of the lacustrine clay and small differences in the groundwater elevations between the dolomite and the

surficial materials suggest that glacial lacustrine clay forms a confining bed separating groundwater within the surficial materials from groundwater in the underlying dolomite. Pursuant to the "North Works Remedial Program" specified in a January 6, 1986, Consent Decree with the MDNR, with the intent of halting the flow of groundwater to the Detroit River and the City of Wyandotte sewerage system, groundwater flow at the Facility has been altered through groundwater extraction in three areas: (i) near the southern boundary of the Facility; (ii) near the intersection of Alkali Road and Wyandotte Road; and (iii) in the vicinity of the polyol plant. Groundwater extracted from the three areas is discharged to the Wayne County Department of Public Works, and ultimately to the Detroit River, pursuant to Wayne County Wastewater Discharge Permit No. D-11311, after treatment with an activated carbon system. Prior to the design, construction and operation of the "North Works Remedial Program," which was intended to prevent groundwater flow to the Detroit River, a hydrogeologic study was conducted by S.S. Papadopulos & Associates, Inc., Consulting Groundwater Hydrologists to BASF [Ref: S.S. Papadopulos, 1984].

G. (1) On October 31, 1983, the Attorney General for the State of Michigan and the Director of the Michigan Department of Natural Resources filed a complaint against BASF Wyandotte Corporation, Civil Action No. 83-CV-4712-DT, in the United States District Court for the Eastern District of Michigan, Southern Division, alleging, inter alia, that the soils, surface water, and groundwater at the Facility were subject to "serious chemical contamination".

(2) On January 6, 1986, a Consent Decree settling the above complaint was entered, requiring, inter alia, that BASF Wyandotte Corporation implement a specified "North Works Remedial Program" designed to halt the flow of contaminated groundwater from the Facility to the Detroit River and the City of Wyandotte sewerage system.

H. Groundwater and soil at the Facility contain hazardous constituents listed at 40 CFR Part 261, Appendix VIII. The locations at which hazardous constituents have been identified are detailed in Table A and Figure A:

(1) Respondent's logs of chemical analyses conducted on the feed to the Facility's groundwater carbon treatment system indicate that during 1992, groundwater extracted at the Facility contained methylene chloride, chloroform, and 1,2 dichloropropane at typical concentrations of 0.5 mg/L, 3 mg/L, and 400 mg/L respectively, with high concentrations greater than 1.5 mg/L, 9.6 mg/L, and 1000 mg/L respectively. A groundwater sample taken by Respondent on or about August 26, 1992, from Facility well E10NB contained a non-aqueous phase component consisting of, in part, 72 percent 1,2 dichloropropane, 9 percent dichloroisopropyl ether, 6 percent dichloroethyl ether, 1 percent 1,2,3 trichloropropane, and 0.5 percent chloroform.

(2) At AOC 2, in the vicinity of the Blend House, Building 60V, especially high levels of benzene and toluene were identified in the May 1992 soil borings SB-10 and SB-13; cresol and pyridine were identified in September 1992 in soil borings in the same area. At SWMU 8, benzene was identified in soil excavated in December 1991 between

extraction wells E2NA and E3NA. At AOC 3, benzene, chlorobenzene, and trichloroethylene were identified in soil excavated in May 1992.

(3) Additional hazardous constituents, detected in groundwater and/or soil at the Facility in June 1981 during the course of a Michigan Department of Natural Resources investigation, included:

> aniline, benzo(a)pyrene, benzo(b)fluoranthene, cadmium compounds (N.O.S.), p-chloro-m-cresol, chromium compounds (N.O.S.), chrysene, dichlorophenol, diethyl phthalate, dimethylphenol, fluoranthene, fluorine, hexachlorobutadiene, lead compounds (N.O.S.), naphthalene, phenol, and bis(2-ethylhexyl) phthalate (a phthalic acid ester).

(4) In a letter dated April 8, 1981, M.A. Wisniewski, Manager, Corporate Environmental Protection for BASF Wyandotte Corporation, indicated that at least one release of RCRA hazardous waste to the nominal 2,000,000 gallon per day surface impoundment has occurred:

> "Once during the past several years an unplanned and sudden spill of hazardous waste was collected and contained in the [surface impoundment] and removed to rail cars within a 48-hour period. This was a one-time emergency action only. Due to the [surface impoundment]'s impermeability (clay base) the short-term action to cleanup the spill prevented environmental contamination."

The locations at which hazardous constituents have been identified are detailed in Table A (Page 16) and Figure A (Page 17):

Table A

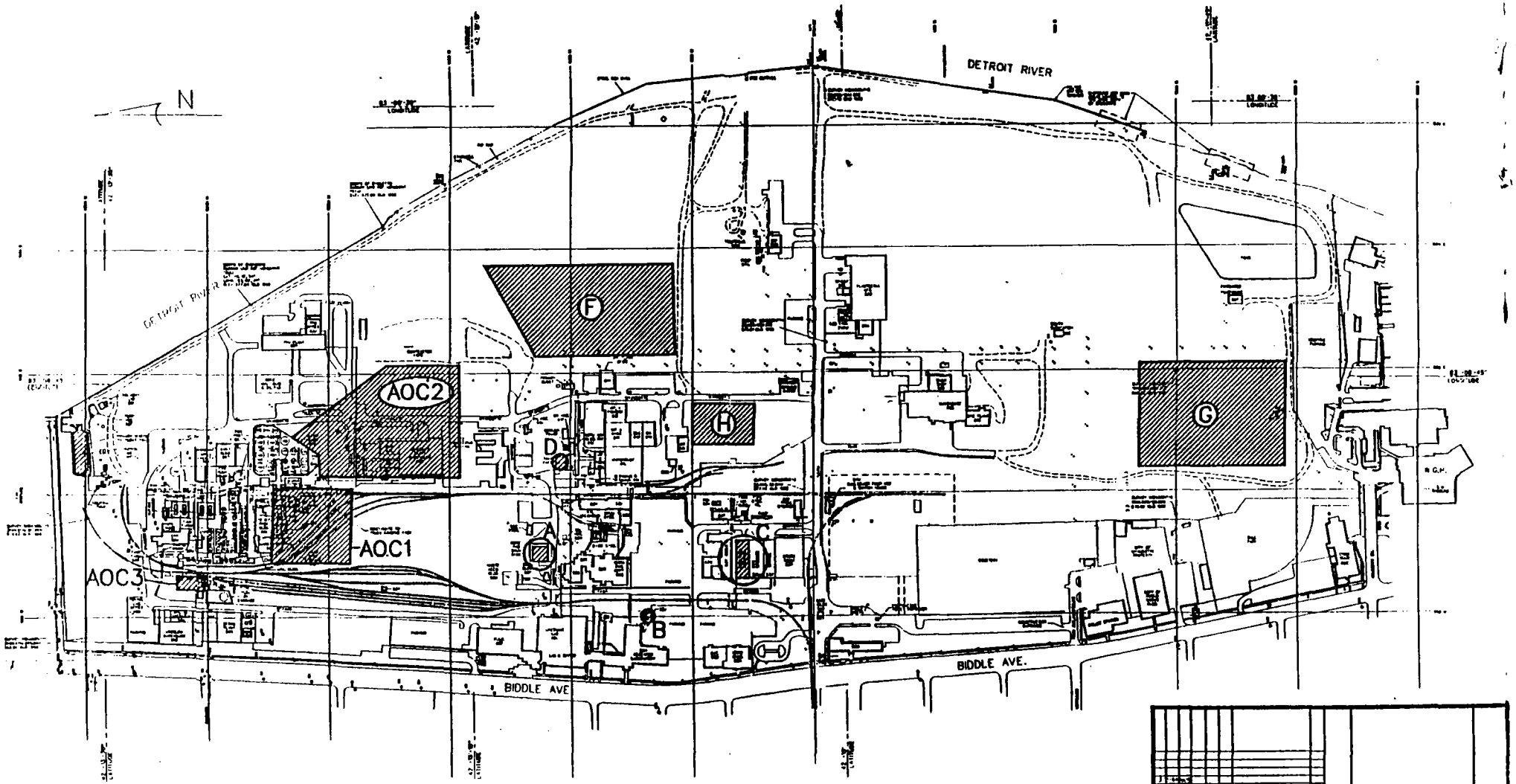
Locations and media of hazardous constituents identified at BASF North Works.

40 CFR Part 261 Appendix VIII Constituent	extracted GW	well E10W8	AOC 1 GW	AOC 1 soil	AOC 2 GW	AOC 2 soil	SWMU F GW	SWMU F soil	SWMU G GW	SWMU G soil	SWMU H GW	SWMU I soil	AOC 3 soil
aniline			X				X				X		
benzene			X		X	X	X		X	X	X		X
benzo(a)pyrene				X									
benzo(b)fluoranthene					X					X	X		
cadmium (N.O.S.)							X						
chlorobenzene													X
chloroform	X	X	X				X						
p-chloro-m-cresol							X					X	
chromium (N.O.S.)					X		X		X				
chrysene					X					X			
cresol			X			X					X		
dichloroethyl ether		X											
dichloroisopropyl ether		X					X	X		X			
dichlorophenol							X						
1,2, dichloropropane	X	X	X				X						
diethyl phthalate										X			
2,4 dimethylphenol			X		X		X		X		X		
fluoranthene										X	X		
fluorine					X					X	X		
hexachlorobutadiene					X								
lead (N.O.S.)					X		X		X				
methylene chloride	X		X										
naphthalene			X	X	X					X	X	X	
phenol			X				X		X		X		
phthalic acid ester			X		X				X		X		
pyridine						X					X		
toluene			X			X	X		X		X		
trichloroethylene													X
1,2,3 trichloropropane		X											

AOC -- Area of Concern

GW -- groundwater

SWMU -- Solid Waste Management Unit



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LEGEND

A - 25,300 GAL. DRUM STG. AREA
B - 100 CU YD CONTAINER STORAGE
C - FORMER (<90 DAY) HAZARDOUS WASTE ACCUMILATION AREA
D - 4000 GAL. ACETIC ACID TANK
E - 2000 K GAL./DAY POLYOL POND
F - FILTER CAKE DISPOSAL AREA
G - RUBBLE DISPOSAL AREAS (2 WITHIN AREA)

H - EMERGENCY CONTAINMENT POND FOR TREATMENT OF WASTEWATER RUN OFF (DISCRIPTION DOES NOT CORRESPOND TO ANY KNOWN AREA) TEMPORARY SURFACE WATER CONTAINMENT PONDS HAVE EXISTED IN THE GENERAL AREA AREA ONCE HAD AN OPEN DITCH SYSTEM (PRE 1980) W/NO TREATMENT

AOC1 - AREA SOUTH OF POLYOL PROCESSING
AOC2 - OLD COKE PLANT AREA
AOC3 - OLD CONCRETE CARBOSE SKIMMER PIT

BMB

WYANDOTTE RCRA PLOT PLAN

WYANDOTTE NW

PLOT PLAN

BASF Corporation

50993

3

FIGURE A

SWMU - Solid Waste Management Unit/AOC - Area of Concern

I. (1) Among the hazardous constituents identified in groundwater or soil at the Facility, U.S. EPA has listed the following as known human carcinogens [Ref: Integrated Risk Information System]:

benzene and hexavalent chromium.

(2) Among the hazardous constituents identified in groundwater or soil at the Facility, U.S. EPA has listed the following as probable human carcinogens [Ref: Ibid.]:

aniline, benzo(a)pyrene, benzo(b)fluoranthene, cadmium, chloroform, chrysene, dichloroethyl ether, lead, methylene chloride, and bis(2-ethylhexyl) phthalate.

(3) Among the hazardous constituents identified in groundwater or soil at the Facility not otherwise listed as known or probable human carcinogens, U.S. EPA has listed the following as systemic toxicants [Ref: Ibid.]:

cresol, chlorobenzene, dichloroisopropyl ether, dichlorophenol, 1,2 dichloropropane, diethyl phthalate, 2,4 dimethylphenol, fluoranthene, fluorine, hexachlorobutadiene, phenol, pyridine, toluene, and 1,2,3 trichloropropane.

These constituents pose a potential threat to human health and the physical and biotic environment.

J. (1) Hazardous wastes or hazardous constituents may further migrate from the Facility into the environment via the following pathways:

(a) Groundwater contaminants may be transported or diffuse to off-site groundwater and to the Detroit River and its sediment in dissolved and non-aqueous phases;

(b) Soil contaminants may be transported to groundwater by percolating surface water;

(c) Volatile soil contaminants and light non-aqueous phase groundwater contaminants may migrate to the ambient air as soil gas.

(2) The Facility is located in the City of Wyandotte, a municipality with a population of 30,938 and a population density of 5,837 people per square mile [Ref: 1990 Census] located near the southern extreme of the Detroit metropolitan area. The City of Wyandotte uses the Detroit River as a source of public drinking water. Lake Erie, into which the Detroit River flows, is also a source of public drinking water. Benthic organisms in the Detroit River represent a fundamental trophic level for local ecological systems. The Detroit River downstream from the Facility and Lake Erie are used extensively by the public for swimming, fishing, and boating, and constitute essential habitat for local and migrating wildlife species and communities.

VI. U.S. EPA'S CONCLUSIONS OF LAW AND DETERMINATIONS

Based on the foregoing Findings of Fact, and after consideration of the Administrative Record, the Waste Management Division Director of U.S. EPA, Region V, has made the following conclusions of law and determinations:

A. Respondent is a "person" within the meaning of Section 1004(15) of RCRA, 42 U.S.C. §6903(15).

B. Respondent is the owner or operator of a facility that has operated, is operating, should be operating or should have been operating under interim status, subject to Section 3005(e) of RCRA, 42 U.S.C. §6925(e).

C. Certain wastes and waste constituents found at the Facility are hazardous wastes or hazardous constituents pursuant to §§1004(5), 3001 of RCRA; 40 CFR Part 261; and, Subpart S, §264.501, 55 Fed. Reg. 30874, July 27, 1990.

D. There is or has been a release(s) of hazardous wastes and/or hazardous constituents into the environment from Respondent's Facility.

E. The actions required by this Consent Order are necessary to protect human health and the environment.

VII. WORK TO BE PERFORMED

Pursuant to Section 3008(h) of RCRA, 42 U.S.C. §6928(h), Respondent agrees and hereby is ordered to perform the following acts in the manner and by the dates specified herein. All work undertaken pursuant to this Consent Order shall be in a manner consistent with at a minimum: the attached Scopes of Work, the U.S. EPA approved RCRA Facility Investigation (RFI) Workplan and Report, Corrective Measures Study (CMS) Workplan and Report, Corrective Measures Implementation (CMI) Workplan and Report, and all other Workplans; RCRA and its implementing regulations; other applicable Federal laws and their regulations, federal and substantive State and local requirements; and applicable U.S. EPA guidance documents. Applicable guidance may include, but is not limited to, documents listed in Attachment VI to this Consent Order, which are incorporated by reference as if fully set forth herein.

A. INTERIM MEASURES (IM)/STABILIZATION

1. Respondent shall evaluate available data and assess the need for IM, in addition to any IM specifically required by this Consent Order. IM shall be used whenever possible to achieve the U.S. EPA's initial goal of stabilization.

2. Respondent shall submit a Current Conditions Report to U.S. EPA in accordance with Section VII.B.: Work to be Performed, RCRA Facility Investigation. The Current Conditions Report shall contain an assessment of previously implemented IM; specifically, the North Works Remedial Program and the voluntary Toluene Remediation Project. The assessment must evaluate other IM alternatives that could be implemented at the Facility and identify any new data needed for making decisions on stabilization. U.S. EPA will review the Current Conditions Report, and after discussion with Respondent, notify Respondent in writing of U.S. EPA's approval, approval with modifications or disapproval in accordance with Section IX.: Agency Approvals/Proposed Contractor/Additional Work. U.S. EPA shall determine if additional data or information shall be collected. U.S. EPA will review Respondent's data and assessment and other information available to U.S. EPA, and if appropriate will select (an) interim measure(s) which Respondent shall perform. If deemed appropriate by U.S. EPA, such selection may be deferred until additional data is collected.

3. In the event Respondent identifies an immediate or potential threat to human health and/or the environment, discovers new releases of hazardous waste and/or hazardous constituents, or discovers new solid waste management units

not previously identified, Respondent shall notify the U.S. EPA Project Coordinator, orally within 48 hours of discovery (or the Region V Emergency Response Line during weekends and holidays at 312-353-2318) and notify U.S. EPA in writing within 14 days of such discovery, summarizing the immediacy and magnitude of the potential threat(s) to human health and/or the environment. Upon written request of U.S. EPA, Respondent shall submit to U.S. EPA an IM Workplan in accordance with the IM Scope of Work, appended as Attachment I. If U.S. EPA determines that immediate action is required, the U.S. EPA Project Coordinator may orally authorize Respondent to act prior to U.S. EPA's receipt of the IM Workplan.

4. If U.S. EPA identifies an immediate or potential threat to human health and/or the environment, discovers new releases of hazardous waste and/or hazardous constituents, or discovers new solid waste management units not previously identified, the U.S. EPA will notify Respondent in writing. Within 30 days of receiving U.S. EPA's written notification, Respondent shall submit to U.S. EPA an IM Workplan in accordance with the IM Scope of Work, that identifies IM which will mitigate the threat. If U.S. EPA determines that immediate action is required, the U.S. EPA Project Coordinator may orally require Respondent to act prior to Respondent's receipt of U.S. EPA's written notification.

5. All IM Workplans shall ensure that the IM are designed to mitigate immediate or potential threat(s) to human health and/or the environment, and should be consistent with the objectives of, and contribute to the performance of, any long-term remedy which may be required at the Facility.

6. In accordance with Attachment I herein, the IM Workplan shall include the following sections: Interim Measures Objectives; Public Participation; Data Collection Quality Assurance; Data Management; Design Plans and Specifications; Operation and Maintenance; Project Schedule; Interim Measure Construction Quality Assurance; and Reporting Requirements.

7. Concurrent with the submission of an IM Workplan, Respondent shall submit to U.S. EPA a Health and Safety Plan in accordance with Attachment I of this Order.

B. RCRA FACILITY INVESTIGATION (RFI)

1. Within ninety (90) days of the effective date of this Consent Order, Respondent shall submit to U.S. EPA a RFI Workplan for a RFI which includes a Current Conditions Report. The RFI Workplan is subject to approval by U.S. EPA in accordance with Section IX.: Agency Approvals/Proposed Contractor/Additional Work, and shall be performed in a manner consistent with the RFI Scope of Work contained in Attachment II. Attachment II to this Consent Order is incorporated by reference as if fully set forth herein. The RFI Workplan shall be developed at a minimum in accordance with RCRA, its implementing regulations, and applicable U.S. EPA guidance documents.

2. The U.S. EPA approved RFI Workplan shall be designed to define the presence, magnitude, extent, direction, and rate of movement of any unpermitted releases of hazardous wastes or hazardous constituents within and beyond the facility boundary. The approved RFI Workplan shall detail the methodology the Respondent shall use to conduct those investigations necessary: (1) to characterize the environmental setting;

(2) to characterize the nature of contaminants; (3) to identify and characterize the potential pathways of contaminant migration; (4) to identify and characterize contaminant plumes; (5) to identify and characterize the source(s) of contamination; (6) to define the degree and extent of contamination; (7) to identify actual and potential physical, human and ecological receptors and their habitats; (8) to identify any additional SWMU and AOC; and (9) to support the development of corrective action objectives, protection standards and alternatives from which a corrective measure may be selected by U.S. EPA. A specific schedule for implementation of all activities shall be included in the approved RFI Workplan.

3. In accordance with the provisions of Attachment II, Task III, the RFI Workplan shall include the following sections: Project Management; Data Collection Quality Assurance; Data Management; and Public Involvement.

4. Concurrent with the submission of an RFI Workplan, Respondent shall submit a Health and Safety Plan in accordance with Attachment II of this Consent Order.

5. Respondent shall submit a RFI report to U.S. EPA for approval in accordance with the EPA approved RFI Workplan schedule. U.S. EPA will review the RFI report and after discussion with Respondent, notify Respondent in writing of EPA's approval, approval with modifications, or disapproval in accordance with Section IX.: Agency Approvals/Proposed Contractor/Additional Work.

C. CORRECTIVE MEASURES STUDY (CMS)

1. Within 60 days of U.S. EPA's approval of the final RFI Report [or Respondent's receipt of a written request from EPA], Respondent shall submit a CMS Workplan to U.S. EPA in accordance with Section IX.: Agency Approvals/Proposed Contractor/Additional Work. The CMS Workplan is subject to approval by U.S. EPA and shall be developed in a manner consistent with the CMS Scope of Work contained in Attachment III to this Consent Order, and incorporated by reference as if fully set forth herein.

2. The CMS shall detail the methodology for developing and evaluating potential corrective measures to remedy any contamination at the facility. The CMS shall be consistent with corrective action objectives and shall identify the potential corrective measures, including any innovative technologies, that may be used for the containment, treatment, and/or disposal of contamination.

3. Respondent shall submit a CMS Report to U.S. EPA for approval in accordance with the U.S. EPA approved CMS Workplan schedule. U.S. EPA will review the CMS Report, and after discussion with Respondent, notify Respondent in writing of U.S. EPA's approval, approval with modifications or disapproval in accordance with Section IX.: Agency Approvals/Proposed Contractor/Additional Work.

4. In accordance with Section VIII.: Public Participation, U.S. EPA will provide the public with an opportunity to submit written and/or oral comments

and an opportunity for a public meeting regarding U.S. EPA's proposed cleanup standards and remedy for the facility.

D. CORRECTIVE MEASURES IMPLEMENTATION (CMI)

1. Within 60 days of Respondent's receipt of notification of U.S. EPA's selection of any corrective measure(s), Respondent shall submit to U.S. EPA a CMI Workplan. The CMI Workplan is subject to approval by U.S. EPA in accordance with Section IX.: Agency Approvals/Proposed Contractor/Additional Work and shall be developed in a manner consistent with the CMI Scope of Work incorporated herein and contained in Attachment IV.

2. The CMI Workplan shall be designed to facilitate the design, construction, operation, maintenance, and monitoring of corrective measures at the facility. In accordance with Attachment IV herein, the CMI Workplan shall also include the following sections: Program Management; Public Participation; Design Plans and Specifications; Operation and Maintenance; Cost Estimate; Project Schedule; Construction Quality Assurance; Data Collection Quality Assurance; and Data Management.

3. Concurrent with the submission of a CMI Workplan, Respondent shall submit to U.S. EPA a CMI Health and Safety Plan in accordance with Attachment IV.

4. U.S. EPA will review the CMI Workplan and after discussion with Respondent, notify Respondent in writing of U.S. EPA's approval, approval with modifications or disapproval, in accordance with Section IX.: Agency Approvals/Proposed Contractor/Additional Work.

5. Respondent shall submit a CMI report to U.S. EPA in accordance with the U.S. EPA approved CMI workplan schedule. U.S. EPA will review the CMI report, and after discussion with Respondent, notify Respondent of U.S. EPA's approval, approval with modifications, or disapproval in accordance with Section IX.: Agency Approvals/Proposed Contractor/Additional Work.

VIII. PUBLIC PARTICIPATION AND COMMENT IN CORRECTIVE MEASURE(S) SELECTION

A. U.S. EPA will provide the public with an opportunity to review and comment on the final draft of the CMS Report and a description of U.S. EPA's proposed corrective measure(s), including U.S. EPA's justification for proposing such corrective measure(s) in the Statement of Basis.

B. Following the public comment period, U.S. EPA may approve the CMS Report and select a final corrective measure(s) or require Respondent to revise the Report and/or perform additional corrective measures studies.

C. U.S. EPA will notify Respondent of the final corrective measure selected by U.S. EPA in the Final Decision and Response to Comments. The notification will include U.S. EPA's reasons for selecting the corrective measure.

IX. AGENCY APPROVALS/PROPOSED CONTRACTOR/ ADDITIONAL WORK

A. U.S. EPA APPROVALS

1. U.S. EPA will provide Respondent with its written approval, approval with conditions and/or modifications, or disapproval with comments, for any workplan, report (except progress reports), specification, or schedule submitted pursuant to or required by this Consent Order. U.S. EPA will provide a statement of reasons for any approval with conditions and/or modifications, or disapproval with comments.

2. Respondent shall revise any workplan, report, specification, or schedule in accordance with U.S. EPA's written comments. Respondent shall submit to U.S. EPA any revised submittals in accordance with the due date specified by U.S. EPA. Revised submittals are subject to U.S. EPA approval, approval with conditions and/or modifications, or disapproval with comments.

3. Upon receipt of U.S. EPA's written approval, Respondent shall commence work and implement any approved workplan in accordance with the schedule and provisions contained therein.

4. Any U.S. EPA approved report, workplan, specification, or schedule shall be deemed incorporated into this Consent Order. Prior to this written approval, no workplan, report, specification, or schedule shall be construed as approved and final. Oral advice, suggestions, or comments given by U.S. EPA representatives will not constitute an official approval, nor shall any oral approval or oral assurance of approval be considered binding.

B. PROPOSED CONTRACTOR/CONSULTANT

All work performed pursuant to this Consent Order shall be under the direction and supervision of a professional engineer, hydrologist, geologist, or environmental scientist, with expertise in hazardous waste cleanup. Respondent's contractor or consultant shall have the technical expertise sufficient to adequately perform all aspects of the work for which it is responsible. Within 14 days of the effective date of this Consent Order, Respondent shall notify the U.S. EPA Project Coordinator in writing of the name, title, and qualifications of the engineer, hydrologist, geologist, or environmental scientist and of any contractors or consultants and their personnel to be used in carrying out the terms of this Consent Order. Respondent shall identify whether any contractor is on the List of Parties Excluded from Federal Procurement or Non-Procurement Programs (See Attachment VI). U.S. EPA reserves the right to disapprove Respondent's contractor at any time during the period that this Consent Order is effective. If U.S. EPA disapproves a contractor or consultant, then Respondent must, within 30 days of receipt from U.S. EPA of written notice of disapproval, notify U.S. EPA's Project Coordinator, in writing, of the name, title, and qualifications of any replacement. U.S. EPA's disapproval shall not be subject to review under Section XVI.: Dispute Resolution.

C. ADDITIONAL WORK

U.S. EPA may determine, or Respondent may propose, that certain tasks, including investigatory work, engineering evaluation, or procedure/methodology modifications, are necessary in addition to or in lieu of the tasks included in any U.S. EPA-approved workplan, to meet the purposes set forth in

Section IV.: Statement of Purpose. If U.S. EPA determines that Respondent shall perform additional work, U.S. EPA will notify Respondent in writing and specify the objective, purpose and basis for its determination that the additional work is necessary. Within 30 days after the receipt of such determination, Respondent shall have the opportunity to meet or confer with U.S. EPA to discuss the additional work. If required by U.S. EPA, Respondent shall submit for U.S. EPA approval a workplan for the additional work. U.S. EPA will specify the contents of such workplan. Such workplan shall be submitted within 60 days of receipt of U.S. EPA's determination that additional work is necessary, or according to an alternative schedule established by U.S. EPA. Upon approval of a workplan by U.S. EPA, Respondent shall implement it in accordance with the schedule and provisions contained therein.

X. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

A. Respondent shall follow U.S. EPA guidance for sampling and analysis. Workplans shall contain QA/QC and chain of custody procedures for all sampling, monitoring, and analytical activities. Any deviations from the QA/QC and chain of custody procedures in approved workplans must be approved by U.S. EPA prior to implementation; must be documented, including reasons for the deviations; and must be reported in the applicable report (e.g., RFI).

B. The name(s), address(es), and telephone number(s) of the analytical laboratories Respondent proposes to use must be specified in the applicable workplan(s).

C. All workplans required under this Consent Order shall include data quality objectives for each data collection activity to ensure that data of known and appropriate quality are obtained and that data are sufficient to support their intended use(s).

D. Respondent shall monitor to ensure that high quality data is obtained by its consultant or contract laboratories. Respondent shall ensure that laboratories used by Respondent for analysis perform such analysis according to the latest approved edition of "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846 Third Edition as amended by Update One, July 1992 and Update Two, August 1993)," or other methods deemed satisfactory to U.S. EPA. If methods other than U.S. EPA methods are to be used, Respondent shall specify all such protocols in the applicable workplan (e.g., RFI). U.S. EPA may reject any data that does not meet the requirements of the approved workplan or U.S. EPA analytical methods and may require additional sampling and analysis.

E. Respondent shall ensure that laboratories it uses for analyses participate in a QA/QC program equivalent to that which is followed by U.S. EPA. U.S. EPA may conduct a performance and QA/QC audit of the laboratories chosen by Respondent before, during, or after sample analyses. Upon request by U.S. EPA, Respondent shall have its laboratory perform analyses of samples provided by U.S. EPA to demonstrate laboratory performance. If the audit reveals deficiencies in a laboratory's performance or QA/QC, additional sampling and analysis may be required.

XI. SAMPLING AND DATA/DOCUMENT AVAILABILITY

A. Respondent shall submit to U.S. EPA upon request the results of all sampling and/or tests or other data generated by divisions, agents, consultants, or contractors pursuant to this Consent Order.

B. Notwithstanding any other provisions of this Consent Order, the United States retains all of its information gathering and inspection authorities and rights, including the right to bring enforcement actions related thereto, under RCRA, CERCLA, and any other applicable statutes or regulations.

C. Respondent shall notify U.S. EPA in writing at least 14 days prior to beginning each separate phase of field work approved under any workplan required by this Consent Order. The notification period may be revised by U.S. EPA on a case-by-case basis after discussion with Respondent. If Respondent believes it must commence emergency field activities without delay, Respondent may seek emergency telephone authorization from the U.S. EPA Project Coordinator or, if the U.S. EPA Project Coordinator is unavailable, her Section Chief, to commence such activities immediately. At the request of U.S. EPA, Respondent shall provide or allow U.S. EPA or its authorized representative to take split or duplicate samples of all samples collected by Respondent pursuant to this Consent Order. Similarly, at the request of Respondent, U.S. EPA shall allow Respondent or its authorized representative(s) to take split or duplicate samples of all samples collected by U.S. EPA under this Consent Order.

D. Respondent may assert a business confidentiality claim covering all or part of any information submitted to U.S. EPA pursuant to this Consent Order. Any assertion of confidentiality must be accompanied by information that satisfies the items listed in 40 CFR §2.204(e)(4) or such claim shall be deemed waived. Information determined by U.S. EPA to be confidential shall be disclosed only to the extent permitted by 40 CFR Part 2. If no such confidentiality claim accompanies the information when it is submitted to U.S. EPA, the information may be made available to the public by U.S. EPA without further notice to Respondent. Respondent agrees not to assert any confidentiality claim with regard to any physical or analytical data.

XII. ACCESS

A. U.S. EPA, its contractors, employees, and/or any duly designated U.S. EPA representatives are authorized to enter and freely move about the facility pursuant to this Order for the purposes of, inter alia: interviewing facility personnel and contractors; inspecting records, operating logs, and contracts related to the facility; reviewing the progress of Respondent in carrying out the terms of this Consent Order; conducting such tests, sampling, or monitoring as U.S. EPA deems necessary; using a camera, sound recording, or other documentary type equipment; and verifying the reports and data submitted to U.S. EPA by Respondent. Respondent agrees to provide U.S. EPA and its representatives access at all reasonable times to the facility and subject to paragraph B below, to any other property to which access is required for implementation of this Consent Order. Respondent shall permit such persons to inspect and copy all records, files, photographs, documents, including all sampling and monitoring data, that pertain to work undertaken pursuant to this

Consent Order and that are within the possession or under the control of Respondent or its contractors or consultants.

B. To the extent that work being performed pursuant to this Consent Order must be done beyond the facility property boundary, Respondent shall use its best efforts to obtain access agreements necessary to complete work required by this Consent Order from the present owner(s) of such property within 30 days of the date that the need for access becomes known to Respondent. Best efforts as used in this paragraph shall include, at a minimum, a certified letter from Respondent to the present owner(s) of such property requesting access agreement(s) to permit Respondent and its authorized representatives to access such property, and the payment of reasonable compensation in consideration of granting access. Any such access agreement shall provide for access by U.S. EPA and its representatives. Respondent shall insure that U.S. EPA's Project Coordinator has a copy of any access agreement(s). In the event that agreements for access are not obtained within 30 days of approval of any workplan for which access is required, or of the date that the need for access became known to Respondent, Respondent shall notify U.S. EPA in writing within 14 days thereafter of both the efforts undertaken to obtain access and the failure to obtain access agreements. U.S. EPA may, at its discretion, assist Respondent in obtaining access. In the event U.S. EPA obtains access, Respondent shall undertake U.S. EPA-approved work on such property.

C. The Respondent agrees to indemnify the United States as provided in Section XXI.: Indemnification, for any and all claims arising from activities on such property.

D. Nothing in this section limits or otherwise affects U.S. EPA's right of access and entry pursuant to applicable law, including RCRA and CERCLA.

E. Nothing in this section shall be construed to limit or otherwise affect Respondent's liability and obligation to perform corrective action including corrective action beyond the facility boundary, notwithstanding the lack of access.

F. U.S. EPA and its representatives shall adhere to the specifics of the Facility Health and Safety Plan, to the extent such Plan does not contradict or impede access and other activities under this Consent Order.

XIII. RECORD PRESERVATION

A. Respondent shall retain, during the pendency of this Consent Order and for a minimum of six (6) years after its termination, all data, records, and documents now in its possession or control or which come into its possession or control which relate in any way to this Consent Order or to hazardous waste management and/or disposal at the facility. Respondent shall notify U.S. EPA in writing 90 days prior to the destruction of any such records, and shall provide U.S. EPA with the opportunity to take possession of any such records. Such written notification shall reference the effective date, caption, and docket number of this Consent Order and shall be addressed to:

William E. Muno, Director
Waste Management Division
USEPA, Region 5
77 W. Jackson Blvd.
Chicago, IL 60604

B. Respondent further agrees that within 30 days of retaining or employing any agent, consultant, or contractor for the purpose of carrying out the terms

of this Consent Order, Respondent will enter into an agreement with any such agents, consultants, or contractors whereby such agents, consultants, and/or contractors will be required to provide Respondent a copy of all documents produced pursuant to this Consent Order.

C. All documents pertaining to this Consent Order shall be stored by the Respondent in a centralized location at the Facility to afford ease of access by U.S. EPA or its representatives.

XIV. REPORTING AND DOCUMENT CERTIFICATION

A. Beginning with the first full month following the effective date of this Consent Order, and throughout the period that this Consent Order is effective, Respondent shall provide U.S. EPA with monthly progress reports. Progress reports are due the tenth day of the month. The progress reports shall conform to requirements in the relevant scope of work contained in Attachments I, II, III, IV, V and VI. U.S. EPA may adjust the frequency of progress reports, after discussion with Respondent, to be consistent with site-specific activities.

B. Three (3) copies of all documents submitted pursuant to this Consent Order shall be in writing and shall be hand delivered, sent by certified mail, return receipt requested, or by overnight express mail to:

1. Documents to be submitted to the U.S. EPA should be sent to:

   Diane M. Sharrow
   Project Coordinator,
   USEPA Region 5, HRE-8J
   77 W. Jackson Blvd.
   Chicago, IL 60604

2. Documents to be submitted to the Respondent should be sent to:

   Adam C. Bickel
   Project Coordinator
   BASF Corporation
   1609 Biddle Avenue
   Wyandotte, MI 48192

Other addresses can also be designated by the Project Coordinators with notice. All documents submitted pursuant to this Consent Order shall be printed on recycled paper and shall be copied double-sided whenever practicable.

C. Any report or other document submitted by Respondent pursuant to this Consent Order which makes any representation concerning Respondent's compliance or noncompliance with any requirement of this Consent Order shall be certified by a responsible corporate officer of Respondent or a duly authorized representative. A responsible corporate officer means: a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation.

D. The certification required by paragraph XIV.C. above, shall be in the following form:

I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to evaluate the information submitted. I certify that the information contained in or accompanying this submittal is true, accurate, and complete. As to those identified portion(s) of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and all attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those directly responsible for gathering the information, or the immediate supervisor of such person(s), the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature:
Name:
Title:
Date:

XV. DELAY IN PERFORMANCE/STIPULATED PENALTIES

A. Unless there has been a written modification by U.S. EPA of a compliance date, a written modification by U.S. EPA of an approved workplan condition, or excusable delay as defined in Section XVII.: Force Majeure and Excusable Delay, if Respondent fails to comply with any term or condition set forth in this Consent Order in the time or manner specified herein, Respondent shall pay stipulated penalties as set forth below upon written demand from U.S. EPA.

1. For failure to commence, perform, and/or complete field work in a manner acceptable to U.S. EPA or at the time required pursuant to this Order: $2,000 per day for the first seven days of such violation, $5,000 per day for the eighth through twenty-first day of such violation, and $8,000 per day for each day of such violation thereafter;

2. For failure to complete and submit any workplans or reports (other than progress reports) in a manner acceptable to U.S. EPA or at the time required pursuant to this Consent Order, or for failure to notify U.S. EPA of immediate or potential threats to human health and/or the environment, new releases of hazardous waste and/or hazardous constituents and/or new solid waste management units not previously identified, as required by this Consent Order: $2,000 per day for the first seven days of such violation, $5,000 per day for the eighth through twenty-first day of such violation, and $8,000 per day for each day of such violation thereafter;

3. For failure to complete and submit other written submittals (not included in paragraph A.1. and A.2. of this section) in a manner acceptable to U.S. EPA or at the time required pursuant to this Consent Order: $1,000 per day for the first seven days of such violation, $2,000 per day for the eighth through twenty-first day of such violation, and $3,500 per day for each day of such violation thereafter;

4. For failure to comply with any other provisions of this Consent Order in a manner acceptable to U.S. EPA: $1,000 per day for the first seven days of such violation, $2,500 per day for the eighth through twenty-first day of such violation, and $3,500 per day for each day of such violation thereafter.

B. Penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs, and shall continue to accrue through the day of correction of the violation. Nothing herein shall prevent the simultaneous accrual of separate stipulated penalties for separate violations of this Consent Order. Penalties shall continue to accrue regardless of whether U.S. EPA has notified the Respondent of a violation.

C. All penalties owed to the United States under this Section shall be due and payable within 30 days of the Respondent's receipt from U.S. EPA of a written demand for payment of the penalties, unless Respondent invokes the dispute resolution procedures under Section XVI.: Dispute Resolution. Such a written demand will describe the violation and will indicate the amount of penalties due.

D. Interest shall begin to accrue on any unpaid stipulated penalty balance beginning on the thirty-first day after Respondent's receipt of U.S. EPA's demand letter. Interest shall accrue at the Current Value of Funds Rate established by the Secretary of the Treasury. Pursuant to 31 U.S.C. § 3717, an additional penalty of 6% per annum on any unpaid principal shall be assessed for any stipulated penalty payment which is overdue for 90 or more days.

E. All penalties shall be made payable by certified or cashier's check to the United States of America and shall be remitted to:

U.S. Department of the Treasury
Attention: USEPA Region 5, Office of the Comptroller
P.O. Box 70753, Chicago, IL 60673

All such checks shall reference the name of the facility, the Respondent's name and address, and the U.S. EPA docket number of this action. Copies of all such checks and letters forwarding the checks shall be sent simultaneously to the U.S. EPA Project Coordinator.

F. Respondent may dispute U.S. EPA's assessment of stipulated penalties by invoking the dispute resolution procedures under Section XVI.: Dispute Resolution. The stipulated penalties in dispute shall continue to accrue, but need not be paid, during the dispute resolution period. Respondent shall pay stipulated penalties and interest, if any, in accordance with the dispute resolution decision and/or agreement. Respondent shall submit such payment to U.S. EPA within seven (7) days of receipt of such resolution in accordance with Paragraph E. of this Section.

G. Neither the invocation of dispute resolution nor the payment of penalties shall alter in any way Respondent's obligation to comply with the terms and conditions of this Consent Order.

H. The stipulated penalties set forth in this section do not preclude U.S. EPA from pursuing any other remedies or sanctions which may be available to U.S. EPA by reason of Respondent's failure to comply with any of the terms and conditions of this Consent Order.

I. No payments under this section shall be tax deductible for federal tax purposes.

XVI. DISPUTE RESOLUTION

A. The parties shall use their best efforts to informally and in good faith resolve all disputes or differences of opinion. The parties agree that the procedures contained in this section are the sole procedures for resolving disputes arising under this Consent Order. If Respondent fails to follow any of the requirements contained in this section, then it shall have waived its right to further consideration of the disputed issue.

B. If Respondent disagrees, in whole or in part, with any written decision ("Initial Written Decision") by U.S. EPA pursuant to this Consent Order, Respondent's Project Coordinator shall notify the U.S. EPA Project Coordinator of the dispute. The Project Coordinators shall attempt to resolve the dispute informally.

C. If the Project Coordinators cannot resolve the dispute informally, Respondent may pursue the matter formally by placing its objections in writing. Respondent's written objections must be directed to the U.S. EPA Project Coordinator and may be copied to U.S. EPA Regional Counsel. This written notice must be mailed to such person(s) within 14 days of Respondent's

receipt of the Initial Written Decision. Respondent's written objection must set forth the specific points of the dispute, the position Respondent claims should be adopted as consistent with the requirements of this Order, the basis for Respondent's position, and any matters which it considers necessary for U.S. EPA's determination.

D. U.S. EPA and Respondent shall have 14 days from U.S. EPA's receipt of Respondent's written objections to attempt to resolve the dispute through formal negotiations. This time period may be extended by U.S. EPA for good cause. During such time period, or Negotiation Period, Respondent may request a conference with the RCRA Enforcement Branch Chief to discuss the dispute and Respondent's objections. U.S. EPA agrees to confer in person or by telephone to resolve any such disagreement with the Respondent as long as Respondent's request for a conference will not extend the Negotiation Period.

E. If the parties are unable to reach an agreement within the Negotiation Period, Respondent has the right to submit any additional written arguments and evidence, not previously submitted, to the Waste Management Division, Associate Director for the Office of RCRA. Based on the record, U.S. EPA shall provide to Respondent its written decision on the dispute ("U.S. EPA Dispute Decision") which shall include a response to Respondent's arguments and evidence. Such decision shall be incorporated into and become an enforceable element of this Consent Order, but will not be considered final Agency action for purposes of judicial review.

F. Except as provided in Section XV.: Delay in Performance/Stipulated Penalties, the existence of a dispute as defined in this section and U.S. EPA's consideration of matters placed into dispute shall not excuse, toll, or suspend any compliance obligation or deadline required pursuant to this Consent Order during the pendency of the dispute resolution process.

G. Respondent may request mediation within 5 days of issuance of the U.S. EPA Dispute Decision if such decision involves a mediated matter as defined in paragraph H. In the event of such a request, the parties agree to follow the procedures in paragraphs H through O below. Alternatively, U.S. EPA and Respondent may agree in writing to waive formal negotiations as outlined above and initiate mediation as outlined below. In this event the references to mediation request should be changed to "the Initiation of Mediation".

H. For purposes of this section, Mediated Matters include: (1) the need for additional work beyond that required in Section VII.: Work to be Performed, costing an additional $250,000; (2) approval of the final RFI report or CMS workplan; or (3) the existence of a force majeure event pursuant to Section XVII.: Force Majeure. Respondent may invoke the mediation process no more than three (3) times during the pendency of this Consent Order.

I. The parties agree that they will share equitably the costs of mediation. The U.S. EPA Project Coordinator shall notify Respondent as to the extent of U.S. EPA Region 5's ability to share equitably the costs of mediation within 5 days of U.S. EPA's receipt of Respondent's request for mediation or within 5 days of the date of the parties' agreement to mediate pursuant to paragraph G.

above. This time period may be extended by the U.S. EPA Project Coordinator if necessary to determine the availability of U.S. EPA Headquarters' funds to share the costs of mediation. U.S. EPA's ability to share the costs of mediation will be determined by U.S. EPA in its sole discretion and shall not be subject to dispute resolution or judicial review. Upon written notice by the U.S. EPA Project Coordinator to Respondent that U.S. EPA cannot equitably share the costs of mediation, the U.S. EPA Dispute Decision shall be incorporated into and become an enforceable element of this Consent Order, but will not be considered final Agency action for purposes of judicial review. If U.S. EPA notifies Respondent that it can equitably share the expenses of mediation then the Parties shall follow the procedures below.

J. If the parties use U.S. EPA's Dispute Resolution Support Services contract they agree to select a mediator(s) in accordance with the following procedures:

(1) Upon receipt of Respondent's request for mediation or the written agreement to mediate pursuant to paragraph G. above, and following U.S. EPA's notification that it can share the expenses of mediation, the parties will be forwarded a list of mediators ("Mediator Selection List") available through the Dispute Resolution Support Services Contract managed by U.S. EPA.

(2) Within 5 days of Respondent's receipt of the Mediator Selection List, the parties shall simultaneously provide each other with a letter ("Mediator Nomination Letter") which shall contain the names of 5 persons from the Mediator Selection List nominated to serve as mediators for the Mediated Matter in dispute.

(3) The mediators nominated by each party must not have any past, present, or planned future business relationships with the parties, other than for mediation activities. They must also agree to the terms and conditions for mediation contained in this Consent Order and enter into an agreement for the provision of ADR services with the parties. All persons nominated shall be provided with a copy of the Consent Order by the nominating party. Any conflicts of interest or refusal to comply with paragraphs M. and N. of this section shall automatically result in rejection of said nominee.

(4) Within 5 days of the receipt of the Mediation Nomination Letters, each party shall advise the other in writing of acceptable nominees. All acceptable nominees who are not automatically rejected pursuant to subparagraph (3) above, shall comprise the Mediator Nomination List. The parties shall select a mediator from the Mediator Nomination List and enter into an agreement for mediation services with such mediator through negotiation and by mutual consent within 20 days of the receipt of the Mediation Nomination Letters.

Alternatively, the parties may select a mediator from any other source of mediators. In this event, the provisions of paragraph J.3. shall continue in effect.

K. The parties agree that the time period for mediation of the matter in dispute is limited to 30 days from the date the parties sign an agreement with a Mediator. This time period may be extended by U.S. EPA.

L. If for any reason the parties are unable to select a mediator, or are unable to approve and execute an agreement for mediation services, or are unable to complete mediation, within the time periods for those activities specified in paragraphs J. and K. above, U.S. EPA's Dispute Decision shall be incorporated into and shall become an enforceable element of this Consent Order upon the conclusion of such time period, but will not be considered final Agency action for purposes of judicial review.

M. Unless the parties agree otherwise in writing, the mediator's role shall be limited to facilitating negotiation between the parties. Mediation sessions shall not be recorded verbatim and no formal minutes or transcripts shall be maintained. Unless the parties agree otherwise, the mediator shall make no written findings or recommendations.

N. Meetings or conferences with the mediator shall be treated as confidential settlement negotiations. Statements made by any person during any such meetings or conferences shall be deemed to have been made in compromise negotiations within the meaning of Rule 408 of the Federal Rules of Evidence

and applicable state rules of evidence, and shall not be offered in evidence in any proceeding by any person. The mediator will be disqualified as a witness, consultant or expert in any pending or future action relating to the subject matter of the mediation, including those between persons not a party to the mediation. If Respondent fails to comply with the mediation confidentiality requirements of this section, then it will forfeit its rights, if any remain, under this Consent Order to request future mediation and may be responsible for stipulated penalties for such breach as provided in Section XV.: Delay in Performance/Stipulated Penalties, Paragraph A.4..

O. Any agreement to resolve the dispute reached by the parties pursuant to this section shall be in writing and shall be signed by both parties. The written agreement shall specify which provisions of the EPA Dispute Decision are superseded and/or modified. If the written agreement is not signed by Respondent within seven (7) days after the resolution of the dispute it shall be null and void and the EPA Dispute Decision shall be incorporated into and become an enforceable element of this Order, but will not be considered final Agency action for purposes of judicial review.

XVII. FORCE MAJEURE AND EXCUSABLE DELAY

A. Force majeure, for purposes of this Consent Order, is defined as any event arising from causes not foreseen and beyond the control of Respondent or any person or entity controlled by Respondent, including but not limited to Respondent's contractors, that delays or prevents the timely performance of any obligation under this Consent Order despite Respondent's best efforts to

fulfill such obligation. The requirement that Respondent exercise "best efforts to fulfill such obligation" shall include, but not be limited to, best efforts to anticipate any potential force majeure event and address it before, during, and after its occurrence, such that any delay or prevention of performance is minimized to the greatest extent possible. Force majeure does not include increased costs of the work to be performed under this Consent Order, financial inability to complete the work, work stoppages or other labor disputes.

B. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Order, whether or not caused by a force majeure event, Respondent shall contact by telephone and communicate orally with U.S. EPA's Project Coordinator or, in his or her absence, the Section Chief or, in the event both of U.S. EPA's designated representatives are unavailable, the Chief of the RCRA Enforcement Branch, U.S. EPA Region 5, within 48 hours of when Respondent first knew or should have known that the event might cause a delay. If Respondent wishes to claim a force majeure event, then within five (5) days thereafter, Respondent shall provide to U.S. EPA in writing the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; all other obligations affected by the event, and what measures, if any, taken or to be taken to minimize the effect of the event on those obligations; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Respondent's rationale for attributing such delay to a force majeure event if it intends to assert such a claim; and a statement as to whether, in the opinion of Respondent, such event may cause or contribute to an

endangerment to public health or the environment. Respondent shall include with any notice all available documentation supporting its claim, if any, that the delay was attributable to a force majeure. Failure to comply with the above requirements shall preclude Respondent from asserting any claim of force majeure for that event. Respondent shall be deemed to have notice of any circumstances of which its contractors had or should have had notice.

C. If U.S. EPA determines that the delay or anticipated delay is attributable to a force majeure event, the time for performance of such obligation under this Consent Order that is affected by the force majeure event will be extended by EPA for such time as EPA determines is necessary to complete such obligation. An extension of the time for performance of such obligation affected by the force majeure event shall not, of itself, extend the time for performance of any other obligation, unless Respondent can demonstrate that more than one obligation was affected by the force majeure event. If U.S. EPA determines that the delay or anticipated delay has been or will be caused by a force majeure event, U.S. EPA will notify Respondent in writing of the length of the extension, if any, for performance of such obligations affected by the force majeure event.

D. If U.S. EPA disagrees with Respondent's assertion of a force majeure event, U.S. EPA will notify Respondent in writing and Respondent may elect to invoke the dispute resolution provision, and shall follow the time frames set forth in Section XVI.: Dispute Resolution. In any such proceeding, Respondent shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a

force majeure event, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Respondent complied with the requirements of this Section. If Respondent satisfies this burden, the time for performance of such obligation will be extended by U.S. EPA for such time as is necessary to complete such obligation.

XVIII. RESERVATION OF RIGHTS

A. U.S. EPA reserves all of its statutory and regulatory powers, authorities, rights, and remedies, both legal and equitable, which may pertain to Respondent's failure to comply with any of the requirements of this Consent Order, including without limitation the assessment of penalties under §3008(h)(2) of RCRA, 42 U.S.C. §6928(h)(2). This Consent Order shall not be construed as a covenant not to sue, release, waiver, or limitation of any rights, remedies, powers, and/or authorities, civil or criminal, which U.S. EPA has under RCRA, CERCLA, or any other statutory, regulatory, or common law authority of the United States.

B. U.S. EPA reserves the right to disapprove of work performed by Respondent pursuant to this Consent Order and to order that Respondent perform additional tasks.

C. U.S. EPA reserves the right to perform any portion of the work consented to herein or any additional site characterization, feasibility study, and remedial work as it deems necessary to protect human health and/or the environment. U.S. EPA may exercise its authority under CERCLA to undertake response actions at any time. In any event, U.S. EPA reserves its right to

seek reimbursement from Respondent for costs incurred by the United States. Notwithstanding compliance with the terms of this Consent Order, Respondent is not released from liability, if any, for the costs of any response actions taken or authorized by U.S. EPA.

D. If U.S. EPA determines that activities in compliance or noncompliance with this Consent Order have caused or may cause a release of hazardous waste or hazardous constituent(s), or a threat to human health and/or the environment, or that Respondent is not capable of undertaking any of the work ordered, U.S. EPA may order Respondent to stop further implementation of this Consent Order for such period of time as U.S. EPA determines may be needed to abate any such release or threat and/or to undertake any action which U.S. EPA determines is necessary to abate such release or threat.

E. This Consent Order is not intended to be nor shall it be construed to be a permit. Further, the parties acknowledge and agree that U.S. EPA's approval of the Consent Order and its Attachments or any final workplan does not constitute a warranty or representation that the Consent Order and its Attachments or workplans will achieve the required cleanup or performance standards. Compliance by Respondent with the terms of this Consent Order shall not relieve Respondent of its obligations to comply with RCRA or any other applicable local, State, or federal laws and regulations.

F. Respondent does not admit any of the factual or legal determinations made by the EPA and reserves all rights and defenses it may have regarding liability or responsibility for conditions at the facility, with the exception

of its right to contest U.S. EPA's jurisdiction to issue or enforce this Consent Order and its right to contest the terms of this Consent Order. Respondent has entered into this Consent Order in good faith without trial or adjudication of any issue of fact or law.

G. Notwithstanding any other provision of this Consent Order, no action or decision by U.S. EPA pursuant to this Consent Order, including without limitation, decisions of the Regional Administrator, the Director of the Waste Management Division, or any authorized representative of U.S. EPA, shall constitute final agency action giving rise to any right of judicial review prior to U.S. EPA's initiation of a judicial action to enforce this Consent Order, including an action for penalties or an action to compel Respondent's compliance with the terms and conditions of this Consent Order.

H. In any action brought by U.S. EPA for a violation of this Consent Order, Respondent shall bear the burden of proving that U.S. EPA's actions were arbitrary and capricious and not in accordance with law.

I. In any subsequent administrative or judicial proceeding initiated by the United States for injunctive or other appropriate relief relating to the facility, Respondent shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States in the subsequent proceeding were or should have been raised in the present matter.

XIX. OTHER CLAIMS

Nothing in this Consent Order shall constitute or be construed as a release from any claim, cause of action, demand, or defense in law or equity, against any person, firm, partnership, or corporation for any liability it may have arising out of or relating in any way to the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous constituents, hazardous substances, hazardous wastes, pollutants, or contaminants found at, taken to, or taken or migrating from the Facility. The Respondent waives any claims or demands for compensation or payment under Sections 106(b), 111, and 112 of CERCLA against the United States or the Hazardous Substance Superfund established by 26 U.S.C. §9507 for, or arising out of, any activity performed or expense incurred pursuant to this Consent Order. Additionally, this Consent Order does not constitute any decision on preauthorization of funds under Section 111(a)(2) of CERCLA.

XX. OTHER APPLICABLE LAWS

All actions required to be taken pursuant to this Consent Order shall be undertaken in accordance with the requirements of all applicable local, state, and Federal laws and regulations. Respondent shall obtain or cause its representatives to obtain all permits and approvals necessary under such laws and regulations.

XXI. INDEMNIFICATION OF THE UNITED STATES GOVERNMENT

Respondent agrees to indemnify and save and hold harmless the United States Government, its agencies, departments, agents, and employees, from any and all claims or causes of action arising solely from or on account of acts or omissions of Respondent or its officers, employees, agents, independent

contractors, receivers, trustees, and assigns in carrying out activities required by this Consent Order. This indemnification shall not be construed in any way as affecting or limiting the rights or obligations of Respondent or the United States under their various contracts. Respondent shall not be responsible for indemnifying the U.S. EPA for claims or causes of action solely from or on account of acts or omissions of U.S. EPA.

XXII. MODIFICATION

A. This Consent Order may only be modified by mutual agreement of U.S. EPA and Respondent. Any agreed modifications shall be in writing, be signed by both parties, shall have as their effective date the date on which they are signed by U.S. EPA, and shall be incorporated into this Consent Order.

B. Any requests for a compliance date modification or revision of an approved workplan requirement must be made in writing. Such requests must be timely and provide justification for any proposed compliance date modification or workplan revision. U.S. EPA has no obligation to approve such requests, but if it does so, such approval must be in writing. Any approved compliance date or workplan modification shall be incorporated by reference into the Consent Order.

C. This section shall not apply to any U.S. EPA dispute decision, U.S. EPA approved report, workplan, specification and schedule which are deemed to be incorporated into this Consent Order.

XXIII. SEVERABILITY

If any provision or authority of this Consent Order or the application of this Consent Order to any party or circumstances is held by any judicial or administrative authority to be invalid, the application of such provisions to other parties or circumstances and the remainder of the Order shall remain in force and shall not be affected thereby.

XXIV. TERMINATION AND SATISFACTION

The provisions of this Consent Order shall be deemed satisfied upon Respondent's and U.S. EPA's execution of an "Acknowledgment of Termination and Agreement to Record Preservation and Reservation of Rights" ("Acknowledgment"). U.S. EPA will prepare the Acknowledgment for Respondent's signature. The Acknowledgment will specify that Respondent has demonstrated to the satisfaction of U.S. EPA that the terms of this Consent Order, including any additional tasks determined by U.S. EPA to be required pursuant to this Consent Order, have been satisfactorily completed. Respondent's execution of the Acknowledgement will affirm Respondent's continuing obligation (1) to preserve all records as required in Section XIII.: Record Preservation and (2) to recognize U.S. EPA's reservation of rights as required in Section XVIII.: Reservation of Rights, after all other requirements of the Consent Order are satisfied.

XXV. EFFECTIVE DATE

The effective date of this Consent Order shall be the date on which it is signed by U.S. EPA. Because the Order was entered with the consent of both parties, Respondent waives its right to request a public hearing pursuant to Section 3008(b) of RCRA, 42 U.S.C. §6928(b).

IT IS SO AGREED:

BY: _____ DATE: February 9, 1994
(Respondent)
Nicola W. Palmieri, General Counsel
BASF Corporation

BY: _____ DATE: 24 February 1994
U.S. Environmental Protection Agency
Norman R. Niedergang
Associate Division Director
Office of RCRA

IT BEING SO AGREED, IT IS HEREBY ORDERED THIS 24th DAY OF

February, 1994.

BY: Wm. E. Muno

William E. Muno
Director
Waste Management Division
U.S. EPA, Region V

Administrative Order On Consent

USEPA ID NO.: MID 064 197 742

ATTACHMENT I
INTERIM MEASURES (IM)
APPENDICES

APPENDIX A. INTERIM MEASURES WORKPLAN

1. Interim Measures Objectives
2. Health and Safety Plan
3. Public Participation

APPENDIX B. INTERIM MEASURES INVESTIGATION PROGRAM

1. Data Collection Quality Assurance
2. Data Management Plan

APPENDIX C. INTERIM MEASURES DESIGN PROGRAM

1. Design Plans and Specifications
2. Operations and Maintenance Plan
3. Project Schedule
4. Final Design Documents

APPENDIX D. INTERIM MEASURES CONSTRUCTION QUALITY ASSURANCE PLAN

1. Construction Quality Assurance Objectives
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APPENDIX E. REPORTS

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APPENDIX A

INTERIM MEASURES WORKPLAN

The Respondent shall prepare an IM Workplan if necessary. The IM Workplan shall include the development of several separate subplans which shall be prepared concurrently.

A. Interim Measures Objectives

The IM Workplan shall specify the objectives of the IM, demonstrate how the IM will abate releases and threatened releases, and to the extent possible, be consistent and integrated with any long-term solution at the facility. The IM Workplan will include a discussion of the technical approach, engineering design, engineering plans (if feasible), schedules, budget, and personnel. The IM Workplan will also include a description of qualifications of personnel performing or directing the IM, including contractor personnel. This IM Workplan shall also document the overall management approach to the IM.

B. Health and Safety Plan

Respondent shall prepare a Facility-specific Health and Safety Plan.

1. Major elements of the Health and Safety Plan shall include:

   a. Facility description, including availability of resources such as roads, water supplies, electricity and telephone services;

   b. Describe the known hazards and evaluate the risks associated with the incident and with each activity conducted;

   c. List key personnel and alternates responsible for site safety, response operations, and for protection of human health;

   d. Describe levels of protection to be worn by personnel;

   e. Delineate work area;

   f. Establish procedures to control site access;

   g. Describe decontamination procedures for personnel and equipment;

   h. Establish site emergency procedures;

   i. Address emergency medical care for injuries and toxicological problems;

   j. Describe requirements for an environmental surveillance program;

   k. Specify any routine and special training required for responders;

l. Establish procedures for protecting workers from weather-related problems; and

m. Establish emergency procedures.

2. The Facility Health and Safety Plan shall be consistent with:

a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);

b. U.S. EPA Order 1440.1 - Respiratory Protection;

c. U.S. EPA Order 1440.3 - Health and Safety Requirements for Employees engaged in Field Activities;

d. Facility Contingency Plan;

e. U.S. EPA Standard Operating Safety Guide (1984);

f. OSHA regulations particularly in 29 CFR 1910 and 1926;

g. State and local regulations; and

h. Other U.S. EPA guidance as provided.

3. The Health and Safety Plan shall be revised to address the activities to be performed at the facility to implement the interim measures.

C. Public Participation Plan

Respondent shall prepare a Public Participation Plan for the dissemination of information to the public regarding IM activities and results. These activities shall include the preparation and distribution of fact sheets and participation in public meetings.

APPENDIX B

INTERIM MEASURES INVESTIGATION PROGRAM

A. Data Collection Quality Assurance (DCQA) Plan

Respondent shall prepare a DCQA Plan to document all monitoring procedures, sampling, field measurements and sample analysis performed during the investigation to characterize the environmental setting, source, and contamination, so as to ensure that all information, data, and resulting decisions are technically sound, statistically valid, and properly documented.

1. Data Collection Strategy

The Data Collection Strategy section of the DCQA Plan shall include but not be limited to the following:

a. A description of the intended uses for the data, and the necessary level of precision and accuracy for these intended uses;

b. A description of methods and procedures to be used to assess the precision, accuracy, and completeness of the measurement data;

c. A description of the rationale used to assure that the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition or an environmental condition. Examples of factors which shall be considered and discussed include:

2. Sampling

The Sampling section of the Data Collection Quality Assurance Plan shall discuss:

a. Selecting appropriate sampling locations, depths, etc.;

b. Providing a statistically sufficient number of sampling sites;

c. Measuring necessary ancillary data;

d. Determining which media are to be sampled (e.g., groundwater, air, soil, sediment, etc.);

e. Determining which parameters are to be measured and where;

f. Selecting the frequency of sampling and length of sampling period;

g. Selecting the types of samples (e.g., composites vs. grabs) and number of samples to be collected;

h. Documenting field sampling operations and procedures, including;

i) Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters, and adsorbing reagents);

ii) Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;

iii) Documentation of specific sample preservation methods;

iv) Calibration of field devices;

v) Collection of replicate samples;

vi) Submission of field-biased blanks, where appropriate;

vii) Potential interferences present at the facility;

viii) Construction materials and techniques, associated with monitoring wells and piezometers;

ix) Field equipment and sample containers listing;

x) Sampling order; and

xi) Decontamination procedures.

i. Selecting appropriate sample containers;

j. Sample preservation; and

k. Chain-of-custody, including:

i) Standardized field tracking reporting forms to establish sample custody in the field prior to shipment; and

ii) Pre-prepared sample labels containing all information necessary for effective sample tracking.

3. Sample Analysis

The Sample Analysis section of the Data Collection Quality Assurance Plan shall specify the following:

a. Chain-of-custody procedures, including:

i) Identification of a responsible party to act as sample custodian at the laboratory, who is authorized to sign for incoming field samples, obtain documents of shipment, and verify the data entered onto the sample custody records;

ii) Provisions for a laboratory samples custody log consisting of serially numbered standard lab-tracking report sheets; and

iii) Specification of laboratory sample custody procedures for sample handling, storage, and dispersement for analysis.

b. Sample storage;

c. Sample preparation methods;

d. Analytical procedures, including;

i) Scope and application of the procedure;

ii) Sample matrix;

iii) Potential interferences;

iv) Precision and accuracy of the methodology; and

v) Method detection limits;

e. Calibration procedures and frequency;

f. Data reduction, validation and reporting;

g. Internal quality control checks, laboratory performance and system audits and frequency, including:

i) Method blank(s);

ii) Laboratory control sample(s);

iii) Calibration check sample(s);

iv) Replicate sample(s);

v) Matrix-spiked sample(s);

vi) "Blind" quality control sample(s);

vii) Control charts;

viii) Surrogate samples;

ix) Zero and span gases; and;

x) Reagent quality control checks.

A performance audit may be conducted by U.S. EPA on the laboratories selected by the Respondent.

3. Graphical Displays

The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleths plots, cross-sectional plots or transects, three dimensional graphs, etc.):

a. Display sampling location and sampling grid;

b. Indicate boundaries of sampling area, and areas where more data are required;

c. Display levels of contamination at each sampling location;

d. Display geographical extent of contamination;

e. Display contamination, levels, averages, and maxima;

f. Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters; and

g. Indicate features affecting intramedia transport showing potential receptors.

APPENDIX C

INTERIM MEASURES DESIGN PROGRAM

A. Design Plans and Specifications

The Respondent shall develop clear and comprehensive design plans and specifications which include but are not limited to the following:

1. Discussion of the design strategy and the design basis, including:

   a. Compliance with all applicable or relevant environmental and public health standards; and

   b. Control and reduction of environmental and public impacts.

2. Discussion of the technical factors of importance including:

   a. Use of currently accepted environmental control measures and technology;

   b. The constructibility of the design; and

   c. Use of currently acceptable construction practices and techniques.

3. Description of assumptions made and detailed justification of these assumptions;

4. Discussion of the possible sources of error and references to possible operation and maintenance problems;

5. Detailed drawings of the proposed design including:

   a. Qualitative flow sheets;

   b. Quantitative flow sheets;

   c. Facility layout; and

   d. Utility locations.

6. Tables listing materials, equipment and specifications;

7. Tables giving material balances;

8. Appendices including:

   a. Sample calculations (one example presented and explained clearly for significant or unique design calculations);

   b. Derivation of equations essential to understanding the report; and

c. Results of laboratory or field tests.

General correlations between drawings and technical specifications, is a basic requirement of any set of working construction plans and specifications. Before submitting the project specifications, the Respondent shall coordinate and cross-check the specifications and drawings and complete the proofing of the edited specifications and required cross-checking of all drawings and specifications.

B. Operation and Maintenance (O&M) Plan

The Respondent shall prepare an O&M Plan to cover both implementation and long-term maintenance of the IM. The O&M Plan shall be composed of the following elements:

1. Equipment start-up and operator training

   The Respondent shall prepare, and include in the technical specifications governing treatment systems, contractor requirements for providing: appropriate service visits by experienced personnel to supervise the installation, adjustment, startup and operation of the treatment systems; and training covering appropriate operational procedures once the startup has been successfully accomplished.

2. Description of normal operation and maintenance

   a. Description of tasks for operation;

   b. Description of tasks for maintenance;

   c. Description of prescribed treatment or operation conditions;

   d. Schedule showing frequency of each O&M task; and

   e. Common and/or anticipated remedies.

3. Description of routine monitoring and laboratory testing

   a. Description of monitoring tasks;

   b. Description of required laboratory tests and their interpretation;

   c. Required QA/QC; and

   d. Schedule of monitoring frequency and date, if appropriate, when monitoring may cease.

4. Description of equipment

   a. Equipment identification;

   b. Installation of monitoring components;

c. Maintenance of site equipment; and

d. Replacement schedule for equipment and installed components.

5. Records and reporting mechanisms required

a. Daily operating logs;

b. Laboratory records;

c. Mechanism for reporting emergencies;

d. Personnel and maintenance records; and

e. Monthly/annual reports to Federal/State agencies.

The O&M Plan shall be submitted with the Final Design Documents.

C. Project Schedule

The Respondent shall develop a detailed Project Schedule for construction and implementation of the IM which identifies timing for initiation and completion of all critical path tasks. Respondent shall specifically identify dates for completion of the project and major interim milestones which are enforceable terms of this order. A Project Schedule shall be submitted simultaneously with the Final Design Documents.

D. Final Design Documents

The Final Design Documents shall consist of the Final Design Plans and Specification (100%) complete, the final Draft Operation and Maintenance Plan, and Project Schedule. The Respondent shall submit the final documents 100% complete with reproducible drawings and specifications. The quality of the design documents should be such that the Respondent would be able to include them in a bid package and invite contractors to submit bids for the construction project.

APPENDIX D

INTERIM MEASURE CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

A. Construction Quality Assurance Objectives

In the CQA Plan, the Respondent shall identify and document the objectives and framework for the development of a construction quality assurance program including, but not limited to the following: responsibility and authority; personnel qualifications; inspection activities, sampling requirements; and documentation. The responsibility and authority of all organizations (i.e., technical consultants, construction firms, etc.) and key personnel involved in the construction of the interim measure should be described fully in the CQA plan. The Respondent must identify a CQA officer and the necessary supporting inspection staff.

B. Inspection Activities

The observations and tests that will be used to monitor the construction and/or installation of the components of the IM shall be summarized in the CQA plan. The CQA Plan shall include the scope and frequency of each type of inspection. Inspections shall verify compliance with all environmental requirements and include, but not be limited to air quality and emissions monitoring records, waste disposal records (e.g., RCRA transportation manifests), etc. The inspection should also ensure compliance with all health and safety procedures. In addition to oversight inspections, the Respondent shall conduct the following activities:

1. Preconstruction inspection and meeting

The Respondent shall conduct a preconstruction inspection and meeting to:

a. Review methods for documenting and reporting inspection data;

b. Review methods for distributing and storing documents and reports;

c. Review work area security and protocol;

d. Discuss any appropriate modifications of the construction quality assurance plan to ensure that site-specific considerations are addressed; and

e. Conduct a site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The preconstruction inspection and meeting shall be documented by a designated person and minutes should be transmitted to all parties.

h. Preventative maintenance procedures and schedules;

i. Corrective action (for laboratory problems); and

j. Turnaround time.

B. Data Management Plan

Respondent shall develop and initiate a Data Management Plan to document and track investigation data and result. This Data Management Plan shall identify and set up data documentation materials and procedures, project file requirements, and project-related progress reporting procedures and documents. The Data Management Plan shall also provide the format to be used to present the raw data and conclusions of the investigation.

All groundwater data shall be submitted in a computer accessible format, i.e., diskette. The format used shall be compatible with the U.S. EPA, Region V groundwater database known as the Groundwater Information Tracking System (GRITS), Version 4.0.

1. Data Record

The Data record shall include the following:

a. Unique sample or field measurement codes;

b. Sampling or field measurement location and sample or measurement types;

c. Sampling or field measurement raw data;

d. Laboratory analysis ID numbers;

e. Properties or components measured; and

f. Result of analysis (e.g., concentration).

2. Tabular Displays

The following data shall be presented in tabular displays:

a. Unsorted (raw) data;

b. Results for each medium, or for each constituent monitored;

c. Data reduction for numerical analysis;

d. Sorting of data by potential stratification factors (e.g., location, soil layer, topography); and

e. Summary data.

2. Prefinal inspection

Upon preliminary project completion, Respondent shall notify U.S. EPA for the purposes of conducting a prefinal inspection. The prefinal inspection will consist of a walk-through inspection of the entire project site. The inspection is to determine whether the project is complete and consistent with the contract documents and the U.S. EPA approved IM. Any outstanding construction items discovered during the inspection will be identified and noted. Additionally, treatment equipment will be operationally tested by the Respondent will certify that the equipment has performed to meet the purpose and intent of the specifications. Retesting will be completed where deficiencies are revealed. The prefinal inspection report should outline the outstanding construction items, actions required to resolve items, completion date for these items, and date for final inspection.

3. Final Inspection

Upon completion of any outstanding construction items, the Respondent shall notify U.S. EPA for the purpose of conducting a final inspection. The final inspection will consist of a walk-through inspection of the project site. The prefinal inspection will be used as a checklist with the final inspection focusing on the outstanding items have been resolved.

4. Sampling and Testing Requirements

The construction phase sampling and testing activities, sample size, sample and test locations, frequency of testing, acceptance and rejection criteria, and plans for correcting problems should be presented in the CQA.

C. Documentation

Reporting requirements for CQA activities shall be described in detail the CQA Plan. This shall include such items as daily summary reports, inspection data sheets, problem identification and IM reports, design acceptance reports and final documentation. Provisions for the final storage of all records shall be presented in the CQA Plan.

APPENDIX E

REPORTS

A. Progress

The Respondent shall at a minimum provide the U.S. EPA with signed, monthly progress reports containing:

1. A description and estimate of the percentage of the IM completed;

2. Summaries of all findings;

3. Summaries of all changes made in the IM during the reporting period;

4. Summaries of all contacts with representatives of the local community, public interest groups, or State government during the reporting period;

5. Summaries of all problems of potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

NOTE: One monthly progress report may be submitted to address all facility site activities under the Consent Order.

B. Interim Measures Workplan

The Respondent shall submit an IM Workplan as described in Appendix A, B, C, and D.

C. Final Design Documents

The Respondent shall submit the Final Design Documents as described in Appendix C.

D. Draft Interim Measures Report

At the "completion" of the construction of the project (except for long-term operations, maintenance and monitoring), the Respondent shall submit an IM Report to the Agency. The IM Report shall document that the project is consistent with the design specifications, and that the IM are

performing adequately. The IM Report shall include, but not be limited to the following elements:

1. Synopsis of the IM and certification of the design and construction;

2. Explanation of any modifications to the IM Plan and why these were necessary for the project;

3. Listing of criteria, established before the IM were initiated, for judging the functioning of the IM and also explaining any modification to these criteria;

4. Results of Facility monitoring, indicating that interim measures will meet or exceed the performance criteria; and

5. Explanation of the operation and maintenance (including monitoring) to be undertaken at the Facility.

This report shall include of the inspection summary reports, inspection data sheets, problem identification and corrective measure reports, block evaluation reports, photographic reporting data sheets, design engineers' acceptance reports, deviations from design and material specifications (with justifying documentation) and as-built drawings.

E. Final Interim Measures Report

The Respondent shall finalize the IM Workplan and the IM Report incorporating comments received on draft submissions.

Facility Submission Summary

A summary of the information reporting requirements contained in the IM Scope of Work is present below:

FACILITY SUBMISSIONS	*DUE DATE
INTERIM MEASURES WORKPLAN -Interim Measures Objectives -Health and Safety Plan -Public Participation Plan -Data Collection QA Plan -Data Management Plan -Construction QA Plan	30 days after U.S. EPA notification
Final Design Documents -Design Plans and Specs -O&M Plan -Project Schedule	90 days after approval of IM Investigation Report
Draft Interim Measures Report	60 days after completion of construction
Final Interim Measures Report	30 days after receipt of U.S. EPA comments on Draft Interim Measures Report
Progress Reports	Monthly

*All dates are calculated from the effective date of this Consent Order unless otherwise specified.

ATTACHMENT II

RCRA FACILITY INVESTIGATION (RFI) SCOPE OF WORK

PURPOSE

The purpose of this RFI is to determine the nature and extent of the release of hazardous waste or hazardous constituents from regulated units, solid waste management units, and other source areas at the Facility, and to gather necessary data to support the CMS. Respondent shall furnish all personnel, materials, and services necessary for, or incidental to, performing the RFI at the BASF Corporation North Works, Wyandotte, Michigan.

SCOPE

The RFI consists of six tasks:

Task I: Description of Current Conditions

- A. Facility Background
- B. Nature and Extent of Contamination
- C. Implementation of IM

Task II: Pre-Investigation Evaluation of Corrective Measure Technologies

Task III: RFI Workplan Requirements

- A. Project Management Plan
- B. Quality Assurance Project Plan (QAPjP)
- C. Data Management Plan
- D. Health and Safety Plan
- E. Public Participation Plan

Task IV: Facility Investigation

- A. Environmental Setting
- B. Source Characterization
- C. Contamination Characterization
- D. Potential Receptors

Task V: Investigation Analysis

- A. Data Analysis
- B. Protection Standards
- C. Preliminary Corrective Action Objectives

Task VI: Reports

- A. Preliminary and Workplan
- B. Progress
- C. Draft and Final

TASK I: DESCRIPTION OF CURRENT CONDITIONS

Respondent shall submit for U.S. EPA approval, a Description of Current Conditions (DCC) Report providing the background information pertinent to the Facility and contamination as set forth below. The data gathered during any previous investigations, and any other relevant data shall be included.

A. Facility Background

The DCC report shall briefly summarize the regional location, pertinent boundary features, general Facility physiography, hydrogeology, and historical use of the facility for the treatment, storage, or disposal of solid and hazardous waste based on reasonably attainable or available information. The DCC Report shall include:

1. Maps depicting the following:

   a. General geographic location;

   b. Property lines with owners of all adjacent property clearly indicated;

   c. Topography and surface drainage depicting waterways, wetlands, floodplains, water features, drainage patterns, and surfacewater containment areas (e.g., U.S.G.S. topographic map or equivalent);

   d. All tanks, buildings, utilities, paved areas, easements, rights-of-way, and other features;

   e. All solid or hazardous waste treatment, storage, or disposal areas active after November 19, 1980;

   f. All known past solid or hazardous waste treatment, storage or disposal areas regardless of whether they were active on November 19, 1980;

   g. All known past and present product and waste underground tanks or piping;

   h. Surrounding land uses (residential, commercial, agricultural, recreational);

   i. The location of all past and present production, recovery and groundwater monitoring wells. These wells shall be clearly labeled, and ground and top of casing elevations and construction details included. These elevations and details may be included as an attachment which outlines well depth, aquifer(s) screened, screen length, screen interval (AMSL), well diameter, well material and openhole or sand/gravel pack interval (AMSL); and

j. Terrestrial Habitat Cover Types (e.g., vegetation communities).

All maps shall be consistent with the requirements set forth in 40 CFR 270.14 and be of sufficient detail and accuracy to locate and report all current and future work performed at the site.

2. A history and description of the ownership and operation, solid and hazardous waste generation, treatment, storage, and disposal activities at the facility, that becomes more detailed as it covers the more recent past.

3. Exact dates or approximate periods of past product and waste spills or deposits, identification of the materials spilled, the amount spilled, the amount recovered, the location where spilled, media impacted, and a description of the response actions conducted (local, State, or Federal response units or private parties), including any inspection reports or technical reports generated as a result of the response.

4. A summary of past and present environmental permits requested and/or received, any enforcement actions and their subsequent responses, and a list of documents and studies prepared for the facility.

5. Description of major habitat types (e.g., grasslands, forests, lakes, streams, wetlands) located in, adjacent to, or affected by the Facility. In delineating wetlands, the U.S. Fish and Wildlife Service's National Wetland Inventory maps should be consulted. The Michigan Department of Natural Resources (MDNR) should be consulted, and wetlands should be delineated using the MDNR Wetland Determination Manual.

6. Description of biota at and adjacent to the Facility should include the following: qualitative observations of resident plants and animals (birds, mammals, fish, stream benthos, etc.); classification of vegetation community types. Rare, threatened and endangered species possibly on, near or utilizing the Facility should be identified as early as possible by consulting with The United States Fish And Wildlife Service, East, Lansing, Michigan and the Michigan Natural Heritage Program.

B. Nature and Extent of Contamination

Respondent shall prepare and submit for U.S. EPA approval, a preliminary Nature and Extent of Contamination (N&EC) Report describing the existing information on the nature and extent of contamination.

1. The N&EC Report shall summarize all possible source areas of contamination. The N&EC Report should include all known or reasonably suspected regulated units, SWMU, AOC, spillage areas, and other suspected source areas of contamination. For each area, Respondent shall identify the following:

   a. Location of unit/area (which shall be depicted on a facility map);

   b. Quantities of solid and hazardous wastes present;

   c. Hazardous waste or constituents, to the extent known; and

   d. Identification of areas where additional information is necessary.

2. Respondent shall prepare an assessment and description of the existing degree and extent of contamination. This should include:

   a. Reasonably available monitoring data and qualitative information on locations and levels of contamination at the facility;

   b. All potential and relevant migration pathways including, if appropriate, information on geology, pedology, physiography, hydrogeology, physiography, hydrology, water quality, meteorology, air quality, and migration through food chains;

   c. Any known or observed effects of site contaminants to biota, such as fish kills, stressed vegetation, or other obvious impacts; and

   d. Potential impacts of contaminants on human health and the environment, including demography, groundwater and surface water use, land use, and potential ecological receptors, including any threatened and endangered species. This assessment should be based on existing site information, literature-based information on contaminant fate and toxicity, and available criteria and standards (e.g., Ambient Water Quality Criteria).

C. Implementation of Interim Measures

If IM are determined to be necessary, Respondent shall prepare and submit for approval, an IM Workplan in accordance with Appendix A of Attachment I to this Scope of Work.

TASK II: PRE-INVESTIGATION EVALUATION OF CORRECTIVE MEASURE TECHNOLOGIES

Prior to starting the RFI, the Respondent shall submit to U.S. EPA a brief Corrective Measures Technology Report that identifies the potential corrective measure technologies that may be used on-site or off-site for the containment, treatment, remediation, and/or disposal of contamination from the Facility. This Corrective Measures Technology Report shall also identify any field data that needs to be collected in the RFI to facilitate the evaluation and selection of the final corrective measures (e.g., compatibility of waste and construction materials, information to evaluate effectiveness, treatability of wastes, etc.).

TASK III: RFI WORKPLAN REQUIREMENTS

Respondent shall prepare a RFI Workplan. The RFI Workplan shall include the development of several separate subplans, which shall be prepared concurrently. During the RFI, it may be necessary to revise the RFI Workplan to increase or decrease the detail of information collected to accommodate the Facility specific situation. The RFI Workplan includes the following:

A. Project Management Plan

Respondent shall prepare a Project Management Plan which will include a discussion of the purpose of the RFI, the DQOs, the technical approach, schedules, budget, and personnel. The Project Management Plan also will include a description of the qualifications of personnel performing or directing the RFI, including contractor personnel. This plan shall document the overall management approach to the RFI.

B. Quality Assurance Project Plan (QAPjP)

Respondent shall prepare a plan to document DQOs, monitoring procedures, sampling, field measurements and sample analyses performed during the investigation to characterize the environmental setting, source, and contamination, so as to ensure that all information, data, and resulting decisions are technically sound, statistically valid, and properly documented. The QAPjP shall be prepared in accordance with Attachment V. A pre-QAPjP meeting shall be held prior to preparation of the QAPjP. Participants should include, but are not limited to the Respondent, their QAPjP preparer, laboratory representatives, U.S. EPA Project Coordinator, U.S. EPA Quality Assurance and Laboratory representatives.

(A performance audit may be conducted by U.S. EPA on laboratories selected by Respondent. This audit, if necessary, must be completed and laboratories approved for use on the project prior to the start of field work for the RFI.)

C. Data Management Plan

Respondent shall develop and initiate a Data Management Plan to document and track investigation data and results. This Data Management Plan shall identify and set up data documentation materials and procedures, project file requirements, and project-related progress reporting procedures and documents. The Data Management Plan shall also provide the format to be used to present the raw data and conclusions of the investigation.

All groundwater data shall be submitted in a computer accessible format, i.e., diskette. The format used shall be compatible with the U.S. EPA, Region V groundwater database known as the Groundwater Information Tracking System (GRITS), Version 4.0.

1. Data Record

The Data record shall include the following:

a. Unique sample or field measurement code;

b. Sampling or field measurement location and sample or measurement type;

c. Sampling or field measurement raw data;

d. Laboratory analysis ID number;

e. Property or component measured; and

f. Result of analysis (e.g., concentration).

2. Tabular Displays

The following data shall be presented in tabular displays:

a. Unsorted (raw) data;

b. Results for each medium, or for each constituent monitored;

c. Data reduction for statistical analysis;

d. Sorting of data by potential stratification factors (e.g., location, soil layer, topography); and

e. Summary data.

3. Graphical Displays

The following data shall be presented in graphical formats as appropriate for the reports (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):

a. Display sampling location and sampling grid;

b. Indicate boundaries of sampling area, and areas where more data are required;

c. Display levels of contamination at each sampling location;

d. Display geographical extent of contamination;

e. Display contamination levels, averages, and maxima;

f. Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters; and

g. Indicate features affecting intramedia transport and show potential receptors.

D. Health and Safety Plan

Respondent shall prepare a Health and Safety Plan.

1. The Health and Safety Plan shall:

a. Provide a facility description, including availability of resources such as roads, water supplies, electricity and telephone service;

b. Describe the known hazards and evaluate the risks associated with the incident and with each activity conducted;

c. List key personnel and alternates responsible for site safety, response operations, and for protection of human health;

d. Delineate work area;

e. Describe levels of protection to be worn by personnel;

f. Establish procedures to control site access;

g. Describe decontamination procedures for personnel and equipment;

h. Establish site emergency procedures;

i. Address emergency medical care for injuries and toxicological problems;

j. Describe requirements for an environmental surveillance program;

k. Specify any routine and special training required for responders; and

l. Establish procedures for protecting workers from weather-related problems.

2. The Facility Health and Safety Plan shall be consistent with:

a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);

b. U.S. EPA Order 1440.1 - Respiratory Protection;

c. U.S. EPA Order 1440.3 - Health and Safety Requirements for Employees engaged in Field Activities;

d. Facility Contingency Plan;

e. U.S. EPA Standard Operating Safety Guide (1984);

f. OSHA regulations, particularly those in 29 CFR 1910 and 1926;

g. State and local regulations; and

h. Other U.S. EPA guidance as provided.

E. Public Participation Plan

The Respondent shall prepare a Public Participation Plan, for the dissemination of information to the public regarding RFI activities and results.

TASK IV: FACILITY INVESTIGATION

Respondent shall conduct those investigations necessary to: characterize the facility (Environmental Setting); define the source (Source Characterization); define the degree and extent of contamination (Contamination Characterization); and identify actual or potential receptors (Receptor Identification). These investigations should result in data of adequate technical content to support the development of corrective action objectives, protection standards and evaluation of the corrective measure alternatives during the CMS.

The investigation activities shall follow the plans set forth in Task III. All sampling and analyses shall be conducted in accordance with the Data Collection Quality Assurance Plan. All sampling locations shall be documented in a log and identified on a detailed site map.

A. Environmental Setting

Respondent shall collect information to supplement and verify existing information on the environmental setting at the facility. Respondent shall characterize the following:

1. Hydrogeology

Respondent shall conduct a program to evaluate hydrogeologic conditions at the facility. This program should provide the following information unless otherwise approved by U.S. EPA:

a. A description of the regional and facility specific geologic and hydrogeologic characteristics affecting groundwater flow beneath the facility, including:

i) Regional and facility specific stratigraphy: description of strata including strike and dip; and identification of stratigraphic contacts;

ii) Structural geology: description of local and regional structural features (e.g., folding, faulting, tilting, jointing, etc.);

iii) Depositional history;

iv) Identification and characterization of areas and amounts of recharge and discharge;

v) Regional and facility specific groundwater flow patterns; and

vi) Seasonal variations in the groundwater flow regime;

b. An analysis of any topographic features that might influence the groundwater flow system;

c. Based on field data, tests, and cores, a representative and accurate classification and description of the hydrogeologic units which may be part of the migration pathways at the facility (i.e., the aquifers and any intervening saturated and unsaturated units), including:

i) Hydraulic conductivity and porosity (total and effective);

ii) Lithology, grain size, sorting;

iii) An interpretation of hydraulic interconnections between saturated zones; and

iv) The attenuation capacity and mechanisms of the natural earth materials (e.g., ion exchange capacity, organic carbon content, mineral content etc.);

d. Based on field studies and cores, structural geology and hydrogeological cross-sections showing the extent (depth, thickness, lateral extent) of hydrogeologic units which may be part of the migration pathways, identifying:

i) Sand and gravel deposits in unconsolidated deposits;

ii) Zones of fracturing or channeling in consolidated or unconsolidated deposits;

iii) Zones of high permeability or low permeability that might direct or restrict the flow of contaminants;

iv) The uppermost aquifer (geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs); and

v) Water-bearing zones above the first confining layer that may serve as a pathway for contaminant migration, including perched zones of saturation;

e. Based on data obtained from groundwater monitoring wells and piezometers installed upgradient and downgradient of the potential contaminant source, a representative description of water level or fluid pressure monitoring, including:

i) Water-level contour and/or potentiometric maps;

ii) Hydrogeologic cross-sections showing vertical gradients;

iii) The flow system, including the vertical and horizontal components of flow; and

iv) Any temporal changes in hydraulic gradients, for example due to tidal or seasonal influences; and

f. A description of man-made influences that may affect the hydrogeology of the site, identifying:

i) Active and inactive local water-supply and production wells with an approximate schedule of pumping; and

ii) Man-made hydraulic structures (pipelines, French drains, ditches, unlined ponds, septic tanks, NPDES outfalls, retention areas, etc.).

2. Soils

Respondent shall conduct a program to characterize the soil and rock units above the water table in the vicinity of the contaminant releases. Such characterization should include, but not be limited to, the following information unless otherwise approved by U.S. EPA:

a. SCS soil classification;

b. Surface soil distribution;

c. Soil profile, including ASTM classification of soils;

d. Transects of soil stratigraphy;

e. Hydraulic conductivity (saturated and unsaturated);

f. Relative permeability;

g. Bulk density;

h. Porosity;

i. Soil sorptive capacity;

j. Cation exchange capacity (CEC);

k. Soil organic content;

l. Soil pH;

m. Particle size distribution;

n. Depth of water table;

o. Moisture content;

p. Effect of stratification on unsaturated flow;

q. Infiltration;

r. Evapotranspiration;

s. Storage capacity;

t. Vertical flow rate; and

u. Mineral content.

3. Surface Water and Sediment

Respondent shall conduct a program to characterize the surface water bodies in the vicinity of the facility relevant to contamination fate and transport. Such characterization should include, but not be limited to, the following activities and information unless otherwise approved by U.S. EPA:

a. Description of the temporal and permanent surface water bodies including:

i) For lakes: location, elevation, surface area, inflow, outflow, depth, temperature stratification, volume, and a description of substrate and cover;

ii) For impoundments: location, elevation, surface area, depth, volume, freeboard, and purpose of impoundment;

iii) For streams, ditches, wetlands, and channels: location, elevation, flow, velocity, depth, width, seasonal fluctuations, and flooding tendencies (i.e., 100 year event), and a description of substrate and surface cover.

iv) Drainage patterns; and

v) Evapotranspiration;

b. Description of the chemistry of the natural surface water and sediments. This includes determining the pH, total dissolved solids, total suspended solids, biological oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients (NH_3, NO_3-/NO_2-, PO_4^{-3}), chemical oxygen demand, total organic carbon, specific contaminant concentrations, etc; and

c. Description of sediment characteristics including:

i) Depositional area;

ii) Thickness profile; and

iii) Physical and chemical parameters (e.g., grain size, distribution, density, organic carbon content, ion exchange capacity, pH, etc., and other parameters as directed by U.S. EPA.

4. Air

Respondent shall provide information characterizing the climate in the vicinity of the facility. Such information should include, but not be limited to, the following information, unless otherwise approved by U.S. EPA:

a. A description of the following parameters:

i) Annual and monthly rainfall averages;

ii) Monthly temperature averages and extremes;

iii) Wind speed and direction;

iv) Relative humidity/dew point;

v) Atmospheric pressure;

vi) Evaporation data;

vii) Development of inversions; and

viii) Climate extremes that have been known to occur in the vicinity of the facility, including frequency of occurrence; and

b. A description of topographic and man-made features which affect air flow and emission patterns, including:

i) Ridges, hills, or mountain areas;
ii) Canyons or valleys;

iii) Surface water bodies (e.g., rivers, lakes, bays, etc.);

iv) Wind breaks and forests; and

v) Buildings.

B. Source Characterization

Respondent shall collect analytical data to completely characterize the wastes and the areas where wastes have been placed, collected, or removed, including: type; quantity; physical form; disposition (containment or nature of deposits); and facility characteristics affecting release (e.g., facility security, and engineered barriers).

This should include quantification of the following specific characteristics, if feasible, at each source area:

1. Unit/Disposal area characteristics:

    a. Location of unit/disposal area;

    b. Type of unit/disposal area;

    c. Design features;

    d. Operating practices (past and present);

    e. Period of operation;

    f. Age of unit/disposal area;

    g. General physical conditions; and

    h. Method used to close the unit/disposal area.

2. Waste characteristics:

    a. Type of wastes placed in each unit, including:

        i) Hazardous classification (e.g., flammable, reactive corrosive, oxidizing or reducing agent);

        ii) Quantity;

        iii) Chemical composition; and

        iv) Waste form (bulk or containerized);

    b. Physical and chemical characteristics:

        i) Physical form (solid, liquid, gas);

        ii) Physical description (e.g., powder, oily sludge);

        iii) Temperature;

        iv) pH;

        v) General chemical class (e.g., acid, base, solvent);

        vi) Molecular weight;

        vii) Density;

        viii) Boiling point;

ix) Viscosity;

x) Solubility in water;

xi) Cohesiveness of the waste;

xii) Vapor pressure; and

xiii) Flash point; and

c. Migration and dispersion characteristics:

i) Sorption;

ii) Biodegradability, bioconcentration, biotransformation;

iii) Photodegradation rates;

iv) Hydrolysis rates; and

v) Chemical transformation.

Respondent shall document the procedures used in making the above determinations.

C. Contamination Characterization

Respondent shall collect analytical data on groundwater, soils, surface water, sediment, air, and subsurface gas contamination in the vicinity of the facility. This data shall be sufficient to define the extent, origin, direction, and rate of movement of contaminant plumes. Data shall include time and location of samplings, medias sampled, concentrations of contaminants found, conditions during sampling, and the identity of the individuals performing the sampling and analysis. Respondent shall address the following types of contamination at the Facility:

1. Groundwater Contamination

Respondent shall conduct a Groundwater Investigation to characterize any plumes of contamination at the Facility. This investigation shall at a minimum provide the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plumes originating from the facility;

b. The horizontal and vertical directions of contamination movement;

c. The velocities of contaminant movement;

d. The horizontal and vertical concentration profiles of Appendix IX constituents in the plumes;

e. An evaluation of factors influencing the plume movement; and

f. An extrapolation of future contaminant movement. Respondent shall document the procedures to be used in making the above determinations (e.g., well design, well construction, geophysics, modeling, etc.).

2. Soil Contamination

Respondent shall conduct an investigation to characterize the contamination of the soil and rock units above the water table in the vicinity of contaminant releases. The investigation should include the following information, unless otherwise approved by U.S. EPA:

a. A description of the vertical and horizontal extent of contamination;

b. A description of contaminant and soil chemical properties within the contaminant source area and plume. This includes contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradability, hydrolysis, photolysis, oxidation, and other factors that might affect contaminant migration and transformation;

c. Specific contaminant concentrations;

d. The velocity and direction of contaminant movement; and

e. An extrapolation of future contaminant movement.

Respondent shall document the procedures used in making the above determinations.

3. Surface Water and Sediment Contamination

Respondent shall conduct a surface water investigation to characterize contamination in surface water bodies resulting from the contaminant releases at the Facility. The investigation should include, but not be limited to, the following information unless otherwise approved by U.S. EPA:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the facility, and the extent of contamination in underlying sediments;

b. The horizontal and vertical direction of contaminant movement;

c. The contaminant velocities;

d. An evaluation of the physical, biological and chemical factors influencing contaminant movement;

e. An extrapolation of pertinent future contaminant movement; and

f. A description of the relevant chemistry of the contaminated surface waters and sediments. This includes determining the pH, total dissolved solids, and specific contaminant concentrations, etc.

Respondent shall document the procedures used in making the above determinations.

4. Air Contamination

Respondent shall conduct an investigation to characterize the particulate and gaseous contaminants released into the atmosphere. This investigation should provide the following information unless otherwise approved by U.S. EPA:

a. A description of the horizontal and vertical direction and velocity of contaminant movement;

b. The rate and amount of releases; and

c. The chemical and physical composition of the contaminants released, including horizontal and vertical concentration profiles.

Respondent shall document the procedures used in making the above determinations.

5. Subsurface Gas Contamination

Respondent shall conduct an investigation to characterize subsurface gases emitted from buried solid and hazardous waste and hazardous constituents in the groundwater. This investigation should provide the following information unless otherwise approved by U.S. EPA:

a. A description of the horizontal and vertical extent of subsurface gas migration;

b. The chemical composition of the gases being emitted;

c. The rate, amount, and density of the gases being emitted; and

d. Horizontal and vertical concentration profiles of the subsurface gases emitted.

Respondent shall document the procedures used in making the above determinations.

D. Potential Receptors Identification

Respondent shall collect data describing the human populations and biotic systems that are susceptible to contaminant exposure from the Facility. Chemical analysis of biological samples may be needed. Data on observable effects in ecosystems also may be needed. The following characteristics shall be identified:

1. Local uses and possible future uses of groundwater:

   a. Type of use (e.g., drinking water source, municipal, residential, agricultural, domestic/non-potable, and industrial); and

   b. Locations of groundwater users, including wells and discharge areas.

2. Local uses and possible future uses of surface water draining from the Facility:

   a. Domestic and municipal (e.g., potable, lawn/gardening watering);

   b. Recreational (e.g., swimming, fishing);

   c. Agricultural;

   d. Industrial; and

   e. Environmental (e.g., fish and wildlife feeding, reproduction, etc.).

3. Human use or access to the Facility and adjacent lands, including but not limited to:

   a. Recreation;

   b. Hunting;

   c. Residential;

   d. Commercial; and

e. Relationship between population locations and prevailing wind direction.

4. A demographic profile of the people who use or have immediate access to the Facility and adjacent land, including, but not limited to: age; sex; and sensitive subgroups.

5. Ecological characteristics of the Facility. Data required for this may include the following:

   a. Chemical sampling in potentially exposed habitats and reference sites.

   b. Toxicity testing.

   c. Tissue analyses.

   d. Biological population, community, ecosystem or habitat assessment.

   e. Habitat assessment of aquatic and terrestrial habitats on or potentially affected by the Facility.

   f. Revised assessment of ecological impacts on receptors. Impacts should include those occurring at individual level (e.g., mortality, growth and reproductive impairments) and those occurring at higher levels of biological organization (i.e., at population, community, and ecosystem levels).

      NOTE: Existing studies may be used to describe or extrapolate ecological characteristics of the Facility, if approved by U.S. EPA.

TASK V: INVESTIGATION ANALYSIS

Respondent shall prepare an analysis and summary of all Facility investigations and their results. The objective of this task shall be to ensure that the investigation data are sufficient in quality (e.g., quality assurance procedures have been followed) and scope to describe the nature and extent of contamination, potential threat to human health and the environment, and to support the development of corrective action objectives, protection standards and the CMS.

A. Data Analysis

Respondent shall analyze all Facility investigation data outlined in Task IV and prepare an Analysis and Summary Report on the type and extent of contamination at the facility including sources and migration pathways. The Analysis and Summary Report shall describe the extent of contamination (qualitative/quantitative) in relation to the background levels indicative for the area.

B. Protection Standards

1. Groundwater Protection Standards

Respondent shall provide information to support the U.S. EPA's selection/development of Groundwater Protection Standards for all of the Appendix IX constituents found in the groundwater during the Facility Investigation (Task IV).

a. The Groundwater Protection Standards shall consist of:

i) Maximum Contaminants Levels (MCLs) for constituents listed in the National Primary Drinking Water Regulations (40 CFR Part 141), if the background level of the constituent is below the given MCL; or

ii) The background level of that constituent in the groundwater;

iii) A U.S. EPA-approved Alternate Concentration Limit (ACL), or

iv) Michigan Act 307 cleanup criteria (Type A, B or C).

b. Information to support the U.S. EPA's subsequent selection of Alternate Concentration Limits (ACLs) shall be developed by the Respondent in accordance with U.S. EPA guidance. For any proposed ACL's, Respondent shall include a justification based upon the criteria set forth in 40 CFR 264.94(b).

c. Within thirty (30) days of receipt of any proposed ACL's, the U.S. EPA shall notify Respondent in writing of approval, disapproval or modifications. The U.S. EPA shall specify in writing the reasons for any disapproval or modification.

d. Within thirty (30) days of receipt of the U.S. EPA's notification of disapproval of any proposed ACL, the Respondent shall amend and submit revisions to the U.S. EPA.

2. Other Relevant Protection Standards

Respondent shall identify and consider all relevant and applicable standards or criteria for protection of human health and the environment (e.g., National Ambient Air Quality Standards, Federally-approved State water quality standards, water quality criteria, health advisories, proposed MCLs, Michigan Act 307 cleanup criteria, etc.).

C. Preliminary Corrective Action Objectives

Preliminary Corrective Action Objectives shall be developed consistent with Federal Statutes and Michigan Act 307. The Act 307 cleanup criteria should be evaluated and the applicability of a Type C remedy should be assessed. A remedy utilizing ACLs should also be evaluated when developing corrective action objectives.

TASK VI: REPORTS

A. Preliminary and Workplan

Respondent shall submit to the U.S. EPA reports on Tasks I and II when it submits the RFI Workplan (Task III).

B. Progress

Respondent shall at a minimum provide U.S. EPA with signed, monthly progress reports containing:

1. A description and estimate of the percentage of the RFI completed;

2. Summaries of all findings;

3. Summaries of all changes made in the RFI during the reporting period;

4. Summaries of all contacts with representatives of local community public interest groups or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

NOTE: One monthly progress report may be submitted to address all site activities under the Consent Order.

C. Draft and Final

Upon U.S. EPA approval, Respondent shall prepare a RFI Report to present Tasks IV and V. The RFI Report shall be developed in draft form for U.S. EPA review. The RFI Report shall be developed in final format incorporating U.S. EPA and public comments received on the Draft RFI Report.

Three copies of all Reports, including the Reports and Workplans in Tasks I, II, III, and both the Draft and Final RFI Reports (Tasks IV and V) shall be provided by the Respondent to U.S. EPA.

Facility Submission Summary

A summary of the information reporting requirements contained in the RFI Scope of Work is presented below.

Facility Submission	Due Date
Description of Current Conditions (Task I)	Within 90 days of the effective date of the Consent Order
Pre-Investigation Evaluation of Corrective Measure Technologies (Task II)	Within 90 days of the effective date of the Consent Order
RFI Workplan (Task III)	Within 90 days of the effective date of the Consent Order
Final RFI Report	contingent on schedule imposed in Workplan
Progress Reports on Tasks I through V	Monthly

ATTACHMENT III

CORRECTIVE MEASURES STUDY (CMS) SCOPE OF WORK

PURPOSE

The purpose of the CMS is to develop and evaluate the corrective action alternatives and to recommend the corrective measures to be taken at the the BASF Corporation North Works, Wyandotte, Michigan. Respondent shall furnish the personnel, materials, and services necessary to prepare the CMS, except as otherwise specified. The CMS may be completed on a SWMU-specific or AOC-specific basis and may include a grouping of units or a site-wide assessment of alternatives as approved by U.S. EPA.

SCOPE

The Respondent shall prepare a CMS Workplan which consists of the following tasks:

Task VII: Identification and Development of the Corrective Measure Alternatives

A. Description of Current Conditions
B. Establishment of Corrective Action Objectives
C. Screening of Corrective Measure Technologies
D. Identification of the Corrective Measure Alternatives

Task VIII: Necessary Laboratory and Bench-Scale Studies

Task IX: Evaluation of the Corrective Measures Alternatives

A. Technical/Environmental/Human Health/Institutional
B. Cost Estimates

Task X: Justification and Recommendation of the Corrective Measures

A. Technical
B. Environmental
C. Human Health

Task XI: Reports

A. Progress
B. Draft
C. Final

TASK VII: IDENTIFICATION AND DEVELOPMENT OF THE CORRECTIVE MEASURE ALTERNATIVES

Based upon the results of the RFI and consideration of the identified Preliminary Corrective Measure Technologies (Task II), Respondent shall identify, screen, and develop the alternatives for removal, containment, treatment, and/or other remediation of the contamination based on the objectives established for the corrective action.

A. Description of Current Conditions

Respondent shall submit an update to the information describing the current conditions the Facility and the known nature and extent of the contamination as documented by the RFI Report. Respondent shall provide an update to the information presented in Task I of the RFI to the U.S. EPA regarding previous response activities and any IM which have been implemented at the Facility. Respondent shall also make a facility-specific statement of the purpose for the response, based on the results of the RFI. The statement of purpose should identify the actual or potential exposure pathways that should be addressed by corrective measures.

B. Establishment of Corrective Action Objectives

Respondent, in conjunction with the U.S. EPA, shall establish site specific objectives for the corrective action needed to protect human health and the environment. These objectives shall be based on public health and environmental criteria, information gathered during the RFI, U.S. EPA guidance, and the requirements of any applicable Federal and State statutes. All corrective actions concerning groundwater releases must be consistent with, and as stringent as, those required under 40 CFR 264.100 and Michigan Act 307.

C. Screening of Corrective Measure Technologies

Respondent shall review the results of the RFI and reassess the technologies specified in Task II to identify any additional technologies which are applicable at the Facility. Respondent shall screen the preliminary corrective measure technologies identified in Task II of the RFI and any supplemental technologies to eliminate those that may not prove feasible to implement, that rely on technologies unlikely to perform satisfactorily or reliably, or that do not achieve the corrective measure objective within a reasonable time period. This screening process focuses on elimination those technologies which have several limitations for a given set of waste and site specific condition. The screening step may also eliminate technologies based on inherent technology limitations.

Site, waste, and technology characteristics which are used to screen inapplicable technologies are described in more detail below:

1. Site Characteristics

Site data should be reviewed to identify conditions that may limit or promote the use of certain technologies. Technologies whose use is clearly precluded by site characteristics should be eliminated from further consideration;

2. Waste Characteristics

Identification of waste characteristics that limit the effectiveness or feasibility of technologies is an important part of the screening process. Technologies clearly limited by these waste characteristics should be eliminated from consideration. Waste characteristics particularly affect the feasibility of in-situ methods, direct treatment methods, and land disposal (on/off-site); and

3. Technology Limitations

During the screening process, the level of technology development, performance record, and inherent construction, operation, and maintenance problems should be identified for each technology considered. Technologies that are unreliable, perform poorly, or are not fully demonstrated may be eliminated in the screening process. For example, certain treatment methods have been developed to a point where they can be implemented in the field without extensive technology transfer or development.

D. Identification of the Corrective Measure Alternatives

Respondent shall develop the corrective measure alternatives based on the corrective action objectives and analysis of Preliminary Corrective Measure Technologies, as presented in Task II of the RFI, and as supplemented following the preparation of the RFI Report. Respondent shall rely on sound engineering practices to determine which of the previously identified technologies appear most suitable for the site. Technologies can be combined to form the overall corrective measure alternatives. The alternatives developed should represent a workable number of options that appear to adequately address corrective action objectives. Each alternative may consist of an individual technology or a combination of technologies. A site-wide alternative may be developed to address corrective action objectives. Respondent shall document the reasons for excluding technologies identified in Task II, as supplemented in the development of the alternatives.

TASK VIII: LABORATORY AND BENCH-SCALE STUDIES

The Respondent shall conduct laboratory and/or bench-scale studies to determine the applicability of corrective measure technologies to Facility conditions if necessary. Respondent shall analyze the technologies based on literature review, vendor contacts, and past experience to determine the testing requirements.

Respondent shall develop a Testing Plan identifying the types and goals of the studies, the level of effort needed, and the procedures to be used for data management and interpretation.

Upon completion of the testing, Respondent shall evaluate the testing results to assess the technologies with respect to the site-specific questions identified in the Testing Plan.

Respondent shall prepare a Summary Report summarizing the testing program and its results, both positive and negative.

TASK IX: EVALUATION OF THE CORRECTIVE MEASURE ALTERNATIVES

Respondent shall describe each corrective measure alternative that passes through the Initial Screening in Task VII and evaluate each corrective measure alternative and its components. The evaluation shall be based on technical, environmental, human health, and institutional concerns. Respondent shall also develop cost estimates for each corrective measure.

A. Technical/Environmental/Human Health/Institutional

Respondent shall provide a description of each corrective measure alternative which includes, but is not limited to the following: preliminary process flow sheets; preliminary sizing and types of construction for buildings and structures; and rough quantities of utilities required. Respondent shall evaluate each alternative in the four following areas:

1. Technical

Respondent shall evaluate each corrective measure alternative based on performance, reliability, implementability, and safety.

a. Respondent shall evaluate each corrective measure alternative based on the effectiveness and useful life of the corrective measure:

i) Effectiveness shall be evaluated in terms of the ability to perform intended functions, such as containment, diversion, removal, destruction, or treatment. The effectiveness of each corrective measure shall be assessed either through qualitative design requirements or by performance evaluation. Specific waste or Facility characteristics which could potentially impede effectiveness shall be considered. The evaluation should also consider the effectiveness of combinations of technologies; and

ii) Useful life is defined as the length of time the level of effectiveness can be maintained. Most corrective measure technologies, with the exception of destruction, deteriorate with time. Often, deterioration can be slowed through proper system operation and maintenance, but the technology eventually may require replacement. Each corrective measure shall be evaluated in terms of the projected service lives of its component technologies. Resource availability in the future life of the technology, as well as appropriateness of the technologies, must be considered in estimating the useful life of the project.

b. Respondent shall provide information on the reliability of each corrective measure including its operation and maintenance requirements and demonstrated reliability:

i) Operation and maintenance requirements include the frequency and complexity of necessary operation and maintenance. Technologies requiring frequent or complex operation and maintenance activities should be regarded as less reliable than technologies requiring little or straightforward operation and maintenance. The availability of labor and materials to meet these requirements shall also be considered; and

ii) Demonstrated and expected reliability is a way of measuring the risk and effect of failure. Respondent shall evaluate whether the technologies have been used effectively under analogous conditions; whether the combinations of technologies have been used together effectively; whether failure of any one technology has an immediate impact on receptors; and whether the corrective measure has the flexibility to deal with uncontrollable changes at the site.

c. Respondent shall describe the implementability of each corrective measure, including the relative ease of installation (constructability) and the time required to achieve a given level of response:

i) Constructability is determined by conditions both internal and external to the facility conditions, and includes such items as location of underground utilities, depth to water table, homogeneity of subsurface materials, and location of the facility (i.e., remote location vs. a congested urban area). Respondent shall evaluate what measures can be taken to facilitate construction under these conditions. External factors which affect implementation include the need for special permits or agreements, equipment availability, and the location of suitable off-site treatment or disposal facilities; and

ii) Time has two components that shall be addressed: the time it takes to implement a corrective measure; and the time it takes to actually see beneficial results. Beneficial results are defined as the reduction of contaminants to some acceptable, pre-established level.

d. Respondent shall evaluate each corrective measure alternative with regard to safety. This evaluation shall include threats to the safety of nearby communities and environments as well as threats to workers during implementation. Factors to consider are fire, explosion, and exposure to hazardous substances.

2. Environmental

Respondent shall assess each alternative to determine its short and long-term beneficial and adverse effects on the environment. Each alternative will be evaluated for its impact on habitat types and plant and animal receptors located in, adjacent to, or affected by the Facility. Receptor impacts should include those occurring at the individual level (e.g., mortality, growth and reproductive impairments) and those occurring at higher levels of biological organization (i.e., at population, community, and ecosystem levels). The assessment should include proposed measures for mitigating adverse impacts.

3. Human Health

Respondent shall assess each alternative in terms of the extent to which it mitigates short and long-term potential exposure to any residual contamination and how it protects human health both during and after implementation of the corrective measure. The assessment will describe the levels and characterizations of contaminants onsite, potential exposure routes, and the potentially affected population. Each alternative will be evaluated to determine the level of exposure to contaminants and the reduction over time. For management of mitigation measures, the relative reduction of impact will be determined by comparing residual levels of each alternative with existing criteria, standards, or guidelines acceptable to U.S. EPA.

4. Institutional

Respondent shall assess relevant institutional needs for each alternative. Specifically, the effects of Federal, State, and local environmental and public health standards, regulation, guidance, advisories, ordinances, or community relation on the design, operation, and timing of each alternative.

B. Cost Estimate

Respondent shall develop an estimate of the cost of each corrective measure alternative (and for each phase or segment of the alternative). The cost estimate shall include both capital and operation and maintenance costs.

1. Capital costs consist of direct (construction) and indirect (nonconstruction and overhead) costs.

   a. Direct capital costs include:

      i) Construction costs: Costs of materials, labor (including fringe benefits and worker's compensation); and equipment required to install the corrective measure;

ii) Equipment costs: Cost of treatment, containment, disposal and/or service equipment necessary to implement the action; these materials remain until the corrective action is complete;

iii) Land and site-development costs: Expenses associated with purchase of land and development of existing property; and

b. Indirect capital costs include:

i) Engineering expenses: Costs of administration, design, construction supervision, drafting, and testing of corrective measure alternatives;

ii) Legal fees and license or permit costs: Administrative and technical costs necessary to obtain licenses and permits for installation and operation;

iii) Startup and shakedown costs: Costs incurred during corrective measure startup; and

iv) Contingency allowances: Funds to cover costs resulting from unforeseen circumstances, such as adverse weather conditions, strikes, and inadequate facility characterization.

2. Operation and maintenance costs are post-construction costs necessary to ensure continued effectiveness of a corrective measure. Respondent consider the following operation and maintenance cost components:

a. Operating labor costs: Wages, salaries, training, overhead, and fringe benefits associated with the labor needed for post-construction operations;

b. Maintenance materials and labor costs: Cost for labor, parts, and other resources required for routine maintenance of facilities and equipment;

c. Auxiliary materials and energy: Costs of such items as chemicals and electricity for treatment plant operations, water and sewer service, and fuel;

d. Purchased services: Sampling cost, laboratory fees, and professional fees for which the need can be predicted;

e. Disposal and treatment costs: Costs of transporting, treating, and disposing of waste materials, such as treatment plant residues, generated during operations;

f. Administrative costs: Costs associated with administration of corrective measure operation and maintenance not included under other categories;

g. Insurance, taxes, and licensing costs: Costs of such items as liability and sudden accidental insurance; real estate taxes on purchased land or right-of-way; licensing fees for certain technologies; and permit renewal and reporting costs;

h. Maintenance reserve and contingency funds: Annual payments into escrow to cover: (1) costs of anticipated replacement or rebuilding of equipment; and (2) any large unanticipated operation and maintenance costs; and

i. Other costs: Items that do not fit any of the above categories.

TASK X: JUSTIFICATION AND RECOMMENDATION OF THE CORRECTIVE MEASURES

Respondent shall justify and recommend corrective measure alternatives using technical, human health, and environmental criteria. The recommendation shall include summary tables which allow the alternatives to be easily understood. Tradeoffs among health risks, environmental effects, and other pertinent factors shall be highlighted. The U.S. EPA will select the corrective measure alternatives to be implemented based on the results of Tasks IX and X. At a minimum, the following criteria will be used to justify the final corrective measures.

A. Technical

1. Performance - corrective measures which are most effective at performing their intended functions and maintaining the performance over extended periods of time will be preferred;

2. Reliability - corrective measures which do not require frequent or complex operation and maintenance activities and that have proven effective under waste and facility conditions similar to those anticipated will be preferred;

3. Implementability - corrective measures which can be constructed and operated to reduce levels of contamination that attain or exceed applicable standards in the shortest period of time will be preferred; and

4. Safety - corrective measures which pose the least threat to the safety of nearby residents and environment as well as workers during implementation will be preferred.

B. Human Health

The corrective measures must comply with existing U.S. EPA criteria, standards, or guidelines for the protection of human health. Corrective measures which provide the minimum level of exposure to contaminants and the maximum reduction in exposure with time will be preferred.

C. Environmental

The corrective measures posing the least adverse impact (or greatest improvement) over the shortest period of time on the environment will be preferred, taking into consideration the legal requirements and the survival needs of rare, threatened and endangered species, populations, communities and ecosystems.

D. Cost-Effectiveness

The corrective measures providing the most cost-effective results may be considered in selecting the final corrective measures. Corrective measures that provide similar levels of protection but are more cost-effective may be preferred. It is not intended to select corrective measures that put financial hardships on the Respondent that impede implementation of corrective measures.

TASK XI: REPORTS

Respondent shall prepare a CMS Report presenting the results of Tasks VII through X and recommending corrective measure alternatives. Three (3) copies of the Draft CMS Report shall be provided by the Respondent to U.S. EPA.

A. Progress

Respondent shall at a minimum provide U.S. EPA with signed, monthly progress reports as required by the Consent Order containing:

1. A description and estimate of the percentage of the CMS completed;

2. Summaries of all findings;

3. Summaries of all changes made in the CMS during the reporting period;

4. Summaries of all contacts with representatives of the local community, public interest groups, or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

NOTE: One monthly progress report may be submitted to address all site activities under the Consent Order.

B. Draft

The Draft CMS Report shall, at a minimum, include:

1. A description of the facility, including a site topographic map (which includes depiction of plant communities and fish and wildlife habitat types) and preliminary layouts;

2. A summary of the corrective measures presenting the results of the evaluation of Tasks VII through X.

C. Final

Respondent shall finalize the CMS Report, incorporating comments received from the public, and U.S. EPA on the Draft CMS Report.

Facility Submission Summary

A summary of the information requirements contained in the CMS Scope of Work is presented below:

Facility Submission	Due Date
CMS Workplan	60 days after U.S. EPA approval of the Final RFI
Draft CMS Report (Tasks VII, VIII, IX, and X)	90 days after U.S. EPA approval of the Final RFI
Final CMS Report (Tasks VII, VIII, IX, and X)	60 days after Public and U.S. EPA - Comments on the Draft Final CMS
Progress Reports on Tasks VII Through X	Monthly

ATTACHMENT IV

CORRECTIVE MEASURES IMPLEMENTATION (CMI) SCOPE OF WORK

PURPOSE

The purpose of the CMI is to design, construct, operate, maintain and monitor the performance of the corrective measure or measures selected by U.S. EPA at BASF Corporation North Works, Wyandotte, Michigan. The Respondent will furnish all personnel, materials and services necessary for the CMI.

SCOPE

The CMI shall consist of four tasks:

Task I: CMI

A. Program Management Plan
B. Public Participation Plan

Task II: Corrective Measure Design

A. Design Plans and Specifications
B. Operation and Maintenance Plan
C. Cost Estimate
D. Project Schedule
E. Construction Quality Assurance Objectives
F. Health and Safety Plan
G. Design Phases

Task III: Corrective Measures Construction

A. Responsibility and Authority
B. Construction Quality Assurance Personnel Qualifications
C. Inspection Activities
D. Sampling Requirements
E. Documentation

Task IV: Reports

A. Progress
B. Draft
C. Final

Task I: CMI PROGRAM PLAN

The Respondent shall prepare and submit a CMI Program Plan. The CMI Program Plan shall include the development and implementation of several separate subplans, which shall be prepared concurrently. The CMI Program Plan includes the following:

A. Program Management Plan

The Respondent shall prepare a CMI Program Management Plan which will document the overall management strategy for performing the design, construction, operation, maintenance and monitoring of Corrective Measures for U.S. EPA review and approval. The CMI Program Management Plan shall document the responsibility and authority of all organizations and key personnel involved with the implementation. The CMI Program Management Plan shall also include a description of qualifications of key personnel directing the Corrective Measure Design and Implementation, including contractor personnel. The Respondent shall submit a final CMI Program Management Plan incorporating U.S. EPA's comments on the Draft CMI Program Management Plan according to the schedule identified in the Submission Summary.

B. Public Participation Plan

The Public Participation Plan shall be revised to describe the public participation program to be implemented by the Respondent during the design and construction subject to the approval of U.S. EPA. Specific activities which must be conducted include the revision of the Public Participation Plan to reflect knowledge of community concerns and involvement during design and construction and the preparation of a fact sheet at the completion of the engineering design. At the request of U.S. EPA, Respondent shall participate in the preparation of information disseminated to the public and in providing information for public meetings that may be held or sponsored by the U.S. EPA.

TASK II: CORRECTIVE MEASURE DESIGN

The Respondent shall prepare final construction plans and specifications for CMI at the Facility which have been selected by U.S. EPA.

A. Design Plans and Specifications

The Respondent shall develop clear and comprehensive design plans and specifications which include but are not limited to the following:

1. Discussion of the design strategy and the design basis, including:

    a. Compliance with all applicable or relevant environmental and public health standards; and

    b. Minimization of environmental and public impacts.

2. Discussion of the technical factors of importance including:

    a. Use of currently accepted environmental control measures and technology;

    b. The constructability of the design; and

    c. Use of currently acceptable construction practices techniques.

3. Description of assumptions made and detailed justification of these assumptions;

4. Discussion of the possible sources of error and references to possible operation and maintenance problems;

5. Detailed drawings of the proposed design including:

    a. Qualitative flow sheets; and

    b. Quantitative flow sheets.

6. Tables listing equipment and specifications;

7. Tables giving material and energy balances;

8. Appendices including:

    a. Sample calculations (one example presented and explained clearly for significant or unique design calculations);

    b. Derivation of equations essential to understanding of the report; and

    c. Results of laboratory or field tests.

B. Operation and Maintenance (O&M) Plan

The Respondent shall prepare an O&M Plan to cover both CMI and maintenance. An initial Draft O&M Plan shall be submitted simultaneously with the Prefinal Design Document submission and the Final Operation and Maintenance Plan with the Final Design documents. The O&M Plan shall include the following elements:

1. Description of normal operation and maintenance:

   a. Description of tasks for operation;

   b. Description of tasks for maintenance;

   c. Description of prescribed treatment or operation conditions; and

   d. Schedule showing frequency of each O&M task.

2. Description of potential operating problems:

   a. Description and analysis of potential operation problems;

   b. Sources of information regarding problems; and

   c. Common and/or anticipated remedies.

3. Description of routine monitoring and laboratory testing:

   a. Description of monitoring tasks;

   b. Description of required laboratory tasks and their interpretation;

   c. Required data collection, QAPjP;

   d. Schedule of monitoring frequency; and

   e. Description of triggering mechanisms for ground water/ surface water monitoring results.

4. Description of alternate O&M:

   a. Should system fail, alternate procedures to prevent release or threatened releases of hazardous substances, pollutants or contaminants which may endanger public health and the environment or exceed cleanup standards; and

   b. Analysis of vulnerability and additional resource requirements should a failure occur.

5. Corrective Steps:

   a. Description of corrective steps to be implemented in the event that cleanup or performance standards are not met; and

   b. Schedule for implementing these corrective steps

6. Safety Plan:

   a. Description of precautions, of necessary equipment, etc., for site personnel; and

   b. Safety tasks required in event of systems failure.

7. Description of equipment:

   a. Equipment identification;

   b. Installation of monitoring components;

   c. Maintenance of site equipment; and

   d. Replacement schedule for equipment and installed components.

8. Records and reporting mechanisms required:

   a. Daily operating logs;

   b. Laboratory records;

   c. Records for operating costs;

   d. Mechanism for reporting emergencies;

   e. Personnel and maintenance records; and

   f. Monthly/annual reports to State agencies.

C. Cost Estimate

The Respondent shall refine the cost estimate developed in the CMS to reflect the more detailed/accurate design plans and specifications being developed. The cost estimate shall include both capital and operation and maintenance costs. An Initial Cost Estimate shall be submitted simultaneously with the Prefinal Design submission and the Final Cost Estimate with the Final Design Document.

D. Project Schedule

The Respondent shall develop a project schedule for construction and implementation of the Corrective Measures which identifies timing for initiation and completion of all critical path tasks. Respondent shall specifically identify dates for completion of the project and major interim milestones. An initial project schedule shall be submitted simultaneously with the Prefinal Design Document submission and the Final Project Schedule with the Final Design Document.

E. Construction Quality Assurance Objectives

The Respondent shall identify and document the objectives and framework for the development of a construction quality assurance program including, but not limited to the following: responsibility and authority; personnel qualifications; inspection activities; sampling requirements and documentation. Draft Construction Quality Assurance Objectives shall be submitted simultaneously with the Prefinal Design Submission and the Final Construction Quality Assurance Objectives shall be submitted following U.S. EPA approval of the Final Design Document.

F. Health and Safety Plan

The Respondent shall submit a Health and Safety Plan to address the activities to be performed at the facility for CMI.

G. Design Phases

The Respondent shall meet regularly with U.S. EPA to discuss design issues. The design of the Corrective Measures shall include the phases outlined below.

1. Preliminary design

The Respondent shall submit the preliminary design when the design effort is approximately 30% complete according to the schedule in the Submission Summary. At this stage, the Respondent shall have field verified the existing conditions at the Facility. The preliminary design shall reflect a level of effort such that the technical requirements of the project have been addressed and outlined so that they may be reviewed to determine if the final design will provide an operable and usable Corrective Measure. Supporting data and documentation shall be provided with the design documents defining the functional aspects of the project. The preliminary construction drawings by the Respondent shall reflect organization and clarity. The scope of the technical specifications shall be outlined in a manner reflecting the final specifications. The Respondent shall include with their preliminary submission, design calculations reflecting the same percentage of completion as the design they support. Predesign work, if required by U.S. EPA, shall be reported at this time.

2. Intermediate design

The intermediate design shall be submitted at 60% completion of the project. The intermediate design submittal should include the following sections:

- standard conditions
- preliminary drawings
- preliminary technical specifications

The detailed plans will have been started at this point. General correlation between drawings and technical specifications is a basic requirement of any set of working construction plans and specifications. Before submitting the project specifications, the Respondents shall:

a. Coordinate and cross-check the specifications and drawings; and

b. Complete the proofing of the edited specifications and required cross-checking of all drawings and specifications.

The Respondent shall prepare, and include in the technical specifications governing treatment systems, contractor requirements for providing: appropriate service visits by experienced personnel to supervise the installation, adjustment, start up and operation of the treatment systems, and training covering appropriate operational procedures once the startup has been successfully accomplished.

3. Prefinal Design

The Respondent shall submit the Prefinal Design according to the schedule in the Submission Summary. The submission shall be at 95% completion of design (i.e., prefinal). The prefinal design submitted should include the following sections in addition to those included in the Intermediate Design:

- Invitation to bid (without date)
- Bid proposal forms (without units)
- Subcontract forms
- Standard conditions

After approval of the prefinal submission, the Respondent shall execute the required revisions and submit the final design (100% completion) with reproducible drawings and specifications.

The prefinal design submittal shall consist of the Design Plans and specifications, Operation and Maintenance Plan, Capital and Operating and Maintenance Cost Estimate, Project Schedule, Construction Quality Assurance Objectives, Specifications for the Health and Safety Plan and Contract and Bidding documents.

4. Final Design

The Respondent shall submit a Final Design according to the schedule in the Submission Summary. The Final Design consists of the Final Design Plans and Specifications (100% complete), the Respondents' Final Construction Cost Estimate, the Final Operation and Maintenance Plan, Construction Quality Assurance Objectives, Final Project Schedule, Final Health and Safety Plan Specifications and Final Contract and Bidding Documents. The quality of the design documents shall be such that they will be ready, as is, for bid advertisement.

5. Additional Studies

The U.S. EPA may require additional studies to supplement the available technical data. The Respondents shall furnish all equipment and personnel necessary to complete any additional work needed. Draft and final reports shall be prepared presenting all data obtained during the additional studies, summary of the results and conclusions.

Task III: CORRECTIVE MEASURE CONSTRUCTION

The Respondent shall finalize the Construction Quality Assurance Plan (CQA) incorporating comments received on the draft CQA Plan submitted with the Prefinal Design. Within 30 days of U.S. EPA approval of the final design, the Respondent shall implement a CQA program to ensure, with a reasonable degree of certainty, that a completed Corrective Measure will meet or exceed all design criteria, plans and specifications. The CQA Plan is a Facility-specific document which must be approved by U.S. EPA prior to the start of the construction. At a minimum, the CQA Plan should include the elements which are summarized below. The Respondent shall construct and implement the Corrective Measures in accordance with the approved design, schedule and CQA Plan following U.S. EPA approval of the CQA Plan. Respondent shall also implement the elements of the approved O&M Plan.

A. Responsibility and Authority

The Respondent shall describe fully in the CQA Plan the responsibility and authority of all organizations (i.e., technical consultants, construction firms, etc.) and key personnel involved in the construction of the corrective measure. The Respondent shall identify a CQA Plan. The Respondent shall also identify a CQA officer and the necessary supporting inspection staff.

B. Construction Quality Assurance Personnel Qualifications

The Respondents shall set forth the qualifications of the CQA Officer and supporting inspection personnel shall be presented in the CQA Plan to demonstrate that they possess the training and experience necessary to fulfill their identified responsibilities.

C. Inspection Activities

The Respondent shall summarize in the CQA Plan the observations and tests that will be used to monitor the construction and/or installation of the components of the Corrective Measures. The CQA Plan shall include the scope and frequency of each type of inspection. Inspections shall verify compliance with environmental requirements and include, but not be limited to air quality and emissions monitoring records, waste disposal records (e.g., RCRA transportation manifests), etc. The inspection shall also ensure compliance with all health and safety procedures. In addition to the oversight inspections, the Respondent shall conduct the following activities:

1. Preconstruction inspection and meeting

The Respondent shall conduct a preconstruction inspection and meeting to:

a. Review methods for documenting and reporting inspection data;

b. Review methods for distributing and storing documents and reports;

c. Review work area security and safety protocol;

d. Discuss any appropriate modifications of the construction quality assurance plan to ensure that site-specific considerations are addressed; and

e. Conduct a site walk-around to verify that the design criteria, plans and specifications are understood and to review material and equipment storage locations. The preconstruction inspection and meeting shall be documented by a designated person and minutes shall be transmitted to all parties.

2. Prefinal inspection

Upon preliminary project completion, Respondent shall notify U.S. EPA for the purposes of conducting a prefinal inspection. The prefinal inspection shall consist of a walk-through inspection of the entire project site. The inspection is to determine whether the project is complete and consistent with the contract documents and the U.S. EPA approved Corrective Measure. Any outstanding construction items discovered during the inspection shall be identified and noted. Additionally, treatment equipment shall be operationally tested by Respondent. The Respondent shall certify that the equipment has performed to meet the purpose and intent of the specifications. Retesting will be completed where deficiencies are revealed. The Respondent shall outline in the prefinal inspection report the outstanding construction items, actions required to resolve items, completion date for these items and date for final inspection.

3. Final inspection

Upon completion of any outstanding construction items, the Respondent shall notify U.S. EPA for the purposes of conducting a final inspection. The final inspection shall consist of a walk-through inspection of the project site. The prefinal inspection report will be used as a checklist with the final inspection focusing on the outstanding construction items identified in the prefinal inspection. Confirmation shall be made that outstanding items have been resolved.

D. Sampling Requirements

The Respondent shall present in the CQA Plan the sampling activities, sample size, sample locations, frequency of testing, criteria for acceptance and rejection and plans for correcting problems as addressed in the project specifications.

E. Documentation

The Respondent shall describe in detail in the CQA Plan the reporting requirements for CQA activities. This detailed description shall include such items as daily summary reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports and final documentation. Provisions for the final storage of all records shall be presented in the CQA Plan.

TASK IV: REPORTS

The Respondent shall prepare plans, specifications and reports as set forth in Tasks I through Task IV to document the design, construction, operation, maintenance and monitoring of the Corrective Measure. Other documentation shall include, but not be limited to the following:

A. Progress

The Respondent shall at a minimum provide the U.S. EPA with signed monthly progress reports during the design and construction phases and semi-annual progress reports for operation and maintenance activities containing:

1. A description and estimate of the percentage of the CMI completed;

2. Summaries of all findings;

3. Summaries of all changes made in the CMI during the reporting period;

4. Summaries of all contacts with representatives of the local community, public interest groups or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/ monitoring data, etc.

NOTE: One monthly progress report may be submitted to address all site activities under the Consent Order.

B. Draft Submittals

1. The Respondent shall submit draft CMI work plans as outlined in Task I;

2. The Respondent shall submit draft Construction Plans and Specifications, Design Reports, Cost Estimates, Schedules, Operation and Maintenance Plans and Study Reports as outlined in Task II;

3. The Respondent shall submit a draft Construction Quality Assurance Program Plan and Documentation as outlined in Task III; and

4. At the completion of the project, the Respondent shall submit a draft CMI Report to the Agency. The CMI Report shall document that the project is consistent with the design specifications, and that the corrective measure is

performing adequately. The CMI Report shall include, but not be limited to the following elements:

a. Synopsis of the corrective measure and certification of the design and construction;

b. Explanation of any modifications to the plans and why these were necessary for the project;

c. Listing of the criteria, established before the remedial action was initiated, for judging the functioning of the remedial action and also providing explanation of any modification to these criteria;

d. Results of facility monitoring, indicating that the remedial action will meet or exceed the performance criteria;

e. Explanation of the operation and maintenance (including monitoring) to be undertaken at the facility; and

f. Data demonstrating that the Cleanup Standards have been achieved.

C. Final Submittals

The Respondents shall finalize the CMi Program Plans, Design Reports, Construction Plans and Specifications, Cost Estimates. Project Schedule, Operation and Maintenance Plan, Study Reports, Construction Quality Assurance Program Plan/Documentation and the CMI Report incorporating comments received on draft submissions.

Submission Schedule

The Respondents shall comply with the information reporting requirements presented below.

FACILITY SUBMISSION	DUE DATE
Draft Program Plans (Task I)	60 days after U.S. EPA final selection of Corrective Measures for facility
Final Program Plan	30 days after receipt of U.S. EPA comments on draft Program Plan

FACILITY SUBMISSION	DUE DATE
Design Phases (Task IIG) - Preliminary Design (30% completion) - Intermediate Design (60% completion) - Prefinal Design (95% completion) - Final Design (100% completion) (Tasks IIA through F) Draft Submittals Construction Designs and Specifications; Operation and Maintenance Plans; Cost Estimate; Additional Studies: Draft Report; Project Schedule; Construction Quality Assurance Objectives; and Health and Safety Plan. Final Submittals Construction Designs and Specifications; Operation and Maintenance Plans; Cost Estimate; Additional Studies: Final Report; Project Schedule; and Health and Safety Plan.	 - 60 days after U.S. EPA approval of final Program Plans - 60 days after U.S. EPA approval of preliminary design, unless additional field work is needed - 60 days after U.S. EPA approval of the final Program Plans - 30 days after U.S. EPA approval of the Prefinal Design Concurrent with submittal of Prefinal Design (95% Design Completion) Concurrent with submittal of Final Design (100% Design Completion)
Draft Construction Quality Assurance Plan (Task II)	Concurrent with submittal of Prefinal Design (95% Design Completion)
Final Construction Quality Assurance Plan (Task III)	21 days after receipt of U.S. EPA comments on draft Construction Quality Assurance Plan
Construction of Corrective Measures	As approved in the Final Design
Prefinal Inspection Report	30 days after Prefinal Inspection
Draft CMI Report (Task IV)	45 days after completion of the construction phase
Final CMI Report (Task IV)	21 days after receipt of U.S. EPA comments on draft CMI Report
Progress Reports for Tasks I through IV	Monthly
Reports during Operation and Maintenance	Semi-annual

Region 5
Model RCRA Quality Assurance Project Plan (QAPP)

The following model document has been prepared by U.S. EPA Region 5 to facilitate preparation of a QAPP based on U.S. EPA Quality Assurance Management Staff and Region 5 requirements. This model is intended to serve as a tool for the production of approvable QAPPs for a wide variety of RCRA investigations.

How to use this document

This document describes the preparation of a QAPP in a series of elements. Each element contains two types of information:

1) Content Requirements (presented as smaller text characters): The first pages of each QAPP element contain requirements which must be described in that QAPP section in order to receive Region 5 approval.

2) Structural Guidance (presented as larger text characters and headed by appropriate section number): This example language is intended to be guidance to show to the QAPP preparer the level of detail that is typically needed to gain Region 5 approval. This example language will appear as follows:

a) Portions of the Model QAPP which are example language are indicated in regular print. During preparation of a facility-specific QAPP, these portions should, of course, be deleted and replaced with the pertinent information for your site.

b) Alternative language specific to RCRA sites, and general notes, are indicated in **bold print.**

c) Some of the example language in this QAPP is applicable to a broad range of sites, and may be considered "boiler-plate". **"Boiler-plate" language is indicated by a dark background, such as you see here.** The "boiler-plate" language should be of wide-ranging applicability, and has been pre-approved by the Region 5 QAS.

All of **the requirements** presented in this model are needed for QAPP **approval** by Region 5. If there is any requirement which is not fully **understood**, it should be brought to the attention of the U.S. **EPA** project manager BEFORE the QAPP is presented to U.S. EPA for review and approval. **If concerns about the requirements in this document are not presented prior to the required submittal date of the draft workplan/QAPP, it will be assumed that the facility using the QAPP concurs with all requirements stated in this document.**

If you have any comments regarding improvements on this model document, please contact George Schupp, Quality Assurance Section Chief, at (312) 886-6221.

DOs AND DON'Ts TO FACILITATE QAPP APPROVAL

1. **DO NOT** submit the laboratory quality assurance program plan attached in an appendix in order to satisfy project-specific quality assurance project plan (QAPP) information. The generic lab QAPPs contain extraneous and ambiguous tables and information.

   DO append or otherwise incorporate into the QAPP the laboratory information that is project-specific (e.g. laboratory chain of custody, internal performance and system audits, etc.) to address certain elements outlined in this document.

2. **DO NOT** reproduce tables containing key information such as types of samples, numbers of investigational and quality control samples per matrix, or lists of target compounds. There should be one table of each kind of information contained in the QAPP.

   DO provide section-specific references when referring to the tabular information in the QAPP, Field Sampling Plan, or RFI Workplan. By doing so, errors caused by not changing duplicated or summarized tables will be minimized.

3. **DO NOT** submit photocopied pages from Test Methods For Evaluating Solid Waste (SW-846) as laboratory SOPs. If, for any reason, there is a need to refer to SW-846, specific references to it may be made.

   DO submit laboratory-specific SOPs for review.

4. **DO NOT** submit copies of manufacturer's guides to operating certain instrumentation such as the field equipment commonly used to detect volatile organic analytes, or for the measurement of pH, Eh, and specific conductance. The U.S. EPA evaluates the operator's standard operating procedure for calibrating and maintaining such instruments.

5. **DO NOT** submit a multiple choice list indicating which methods will be used to analyze certain hazardous constituents. Only the instrumental and preparatory/cleanup/extraction/digestion procedures that will actually be utilized for analysis must be indicated in the QAPP. If SW-846 offers a selection of possibilities for performing the analyses, then the QAPP must specify which methods will actually be used.

6. **DO NOT** submit a QAPP to the U.S. EPA for review until a laboratory has been selected by the facility for completing all work. Once a selection has been made, laboratories cannot be changed due to a possible lab audit by U.S. EPA.

7. **DO NOT** write the QAPP until a pre-QAPP meeting has been held. This meeting involves representatives of the laboratory, the facility, and the U.S. EPA for the purpose of defining project objectives and evaluating potential QA problems during implementation of the workplan.

8. **DO** provide in the QAPP the complete list of hazardous constituents to be measured and reported for the facility project. Such lists will be consistent with those constituent lists for which the methods have been validated.

9. **DO** provide information on sample tags. Sample tags are required for all samples taken in the field, as part of the chain of custody procedure.

10. **DO** provide a data deliverables package which will reflect a "CLP-like deliverables" format (the CLP forms are not required but the same information must be supplied).

11. **DO** provide for a data validation process which will validate 100% of the data by a party independent of the laboratory generating such data. This validation will be performed prior to transmittal to the U.S. EPA. All data must be made available to the U.S. EPA immediately upon request.

12. **DO** provide copies of the draft QAPP and revisions to the appropriate laboratory personnel in order to ensure the laboratory can meet the requirements of the QAPP.

13. **DO NOT** submit the entire QAPP document upon resubmittal.

    DO submit only those pages which were revised from the previous submittal.

QUALITY ASSURANCE PROJECT PLAN

FOR THE RCRA [PROJECT TYPE] AT

[FACILITY NAME]

U.S. EPA ID NUMBER [ILD 000 000 000]

REVISION [NUMBER]

[DATE OF SUBMITTAL]

Prepared by: [Contractor Name]

Prepared for: [Facility/Contractor]

[Contractor Project Manager]	Date
[Contractor QA Officer]	Date
[Laboratory QA Manager] (if applicable)	Date
U.S. EPA RCRA Project Coordinator/ RCRA Permit Writer	Date
U.S. EPA Regional Quality Assurance Manager	Date

QAPP ELEMENT 1

TITLE / SIGNATURE PAGE

The QAPP must contain a Title/Signature Page. This title page will document the following:

1) The complete title of the program and investigation (e.g. RCRA Facility Investigation, etc.) specifying the location (city, state) of the facility and its U.S. EPA identification number;

2) The firm that prepared the plan as well as the organization for whom it was prepared; and

3) The date and the revision number (the initial draft should be considered Revision 0 and subsequent revisions as Revision 1, 2 etc.).

Functionally, this page ensures that the desired content and level of detail are achieved through the review and approval (at a minimum) by the following personnel:

- o Facility Quality Assurance Officer
- o QAPP Preparer
- o US EPA Project Coordinator/Permit Writer
- o US EPA Regional Quality Assurance Manager
- o Laboratory Directors

NOTE: The titles and names of all individuals appearing on the title page will be consistent with the references to these people elsewhere in the QAPP (e.g. project organization, corrective action, and QA reports to management sections).

QAPP ELEMENT 2

TABLE OF CONTENTS

All QAPP sections, tables, figures, and appendices (and contents of individual Appendices) shall be included in a Table of Contents. All subsections shall be numbered as in the sample Table of Contents. For instance, in the submitted QAPP, section 3.2 should correspond to "Accuracy".

Additionally, the QAPP Table of Contents shall address each of the following items:

1. An "Introduction" to the QAPP shall be referenced in the QAPP's Table of Contents.

2. A serial listing of the 16 QAPP elements shall be presented according to the structure indicated in the sample Table of Contents.

3. A listing of any appendices and subsections which are required to augment the QAPP as presented (i.e., standard operating procedures (SOPs), summaries of past data, etc.) shall be presented.

4. Following the list of appendices, a listing of any tables and figures which are required to augment the QAPP requirements shall be presented.

5. After the list of appendices will follow a complete listing of recipients including the U.S. EPA Quality Assurance Section Chief who will receive official copies of the QAPP and any subsequent revisions.

Page numbers shall be added to the Table of Contents of the submitted QAPP. Furthermore, within the body of the submitted QAPP, page numbers will be presented in accordance with the Document Control Format (DCF). A DCF should be used to individually paginate each QAPP element to facilitate revisions as well as ensure that no pages are missing. The DCF to be placed in the upper right hand corner of each page shall include:

1. Project Name

2. Revision Number

3. Revision Date

4. Section

5. Page Number

The Project Name may be shortened or abridged as necessary. The Page Number will be stated relative to the total number in the section (e.g. Section 4, Page 2 of 8). A new QAPP section will be started at page one. All other documents which are referenced in the QAPP (Work Plan, Field Sampling Plan, etc.) and have become a part of the QAPP by such reference should also include the DCF. A sample Table of Contents is shown below. Although minor deviations from this example will be permissible, each of the section headings and subheadings shown in the example must be included in the submitted Table of Contents and the submitted QAPP must be organized as reflected in the following Table of Contents.

TABLE OF CONTENTS

Page

Page

Page

Page

Page

QAPP ELEMENT 3

PROJECT DESCRIPTION

All the QAPP elements are significant, in the sense that all can be viewed as integrally defining a process which when implemented can result in generated data that will be of documented quality, and also hopefully of a known reliable nature. However, the Project Description remains one of the most critical elements of a QAPP. For it is in this particular element that the purpose for implementing the project in a particular fashion, as well as the ultimate goals that are desired to be achieved, are fully explained.

Programmatic regulatory provisions usually require that environmental chemical measurements must be made in order to address certain Federal requirements or criteria, many of the project objectives that will be defined here shall, most often, be defined programmatically. However, this is the portion of the QAPP where it is necessary to define site-specific details so that generally stated Federal requirements, such as the need to investigate in order to "define the horizontal and vertical extent and rate of contamination" must be fully fleshed out into a working program for facility investigation.

QAPP preparers are encouraged to seek and present in this portion of the QAPP the known action or environmental criteria or health based levels (both State and Federal) which generated data may be eventually compared to. Outside of improper implementation of an approved QAPP through field sampling, or laboratory error, poorly defined project objectives may be the area most likely to result in unusable data. If the purpose of the overall project is not thought out carefully or conscientiously beforehand, then ultimately the generated data may not prove to be useful for any of a number of programmatic goals. Even if the data collected has been shown to be of known, documented quality and potentially useable for one particular function, if the data is later found not to address the real objectives that should have been defined before project implementation, then the investigation may have to be repeated!

The Project Description should include or reference the following items. (A technical person unfamiliar with the project must be able to understand what you have written.)

- A statement of the decision(s) to be made or the question(s) to be answered.
- A description of the site, facility, process, and/or operating parameters to be studied.
- The anticipated uses of the data.
- A list of all environmental measurements to be performed.
- A project schedule, indicating when samples are expected to be submitted to the laboratory.
- A summary table listing, for each sampling location, the total numbers of samples (including investigative, quality control, split and reserve), sample type or matrix,and all measurements to be performed, differentiating where applicable the critical measurements from the noncritical measurements.

The contents requirements for Project Description are more fully outlined below. If sections in the RFI Workplan, or Description of Current Conditions Report are found to address some of these items (shown in boldface), then specific sections (page or section numbers) of these identified reports may be referenced in the Project Description portion of the QAPP:

In the **Introduction** to the QAPP, the overall project objectives should be explained. This should be a succinct description of the project, including a brief statement addressing the phase(s) of the work and intended objectives and investigation. The section should answer the basic questions, "What is the purpose of the work effort?", and "Why has the facility been asked to complete the work?".

The **Site Description** should focus on a description of site-specific features, including location, size, borders, important physical features, topographic, geological and hydrogeological information. Each of these items should be clearly addressed. The QAPP preparer should also consider whether there are any unique or special site-specific features of any kind which may have some later bearing on the way in which data is obtained.

Under the **Site History or Background** section of this element, the chronological history of the site leading to its current status under RCRA should be outlined. Documentation of waste streams managed and releases known to have occurred on-site, a summary of any previous sampling and analysis efforts, data with overview of these results or copies of previous reports should be appended to the QAPP. Site histories are unique and often there are large historical gaps. Usually, much of the known information has already been gathered prior to the stage where an RFI is being conducted. Therefore, summaries of this information may only be required here, provided that the facility can identify previously generated reports precisely by title, date, and author.

The Project Objectives must be clearly outlined. There should be a succinct description of specific project objectives in terms of individual task or phase of work. This is the section where the QAPP preparer should discuss how the general programmatic goals can be addressed through specific tasks that will be implemented.

Target compounds and parameters must be described. The QAPP preparer must provide a list of all compounds that will be analyzed in samples taken from the facility. For the purposes of the RCRA program, such compounds, analytes, and parameters may be derived from any of a number of lists such as the Hazardous Substance List, the 40 CFR Part 261 Appendix VIII or IX lists, the toxicity characteristic list, method specific lists (where the methods have been validated for sets of constituents regulated under RCRA or by the U.S. EPA, such as the SW-846 1986 or 1990 version methods, the CLP methods), or other parameters such as those of possible use to hydrologists in assessing general groundwater quality.

In preparing a facility-specific target list, there are three rules of thumb to be aware of. First, any set of constituents representing a subset of the Appendix IX list must be supplemented with a good rationale for why certain constituents have been eliminated from the list of target compounds for the proposed project. Secondly, the selection of constituents must be shown to be consistent with the overall objectives or programmatic goals intended for the proposed project. Thirdly, even though the U.S. EPA shall consider the rationale presented for why certain constituents can be excluded from the facility list, if proposed analytical methods or strategies will still allow analytical measurement of those constituents (proposed for exclusion) anyway, then those constituents must also be reported in the RFI report. Tabular presentation of the actual list is preferred when used in conjunction with the rationale, and the list should address each matrix to be encountered, as well as the intended data usages, and anticipated method detection limits for each constituent in its respective matrix.

The Intended **Data usages** should provide a brief statement outlining the specific usages of all data to be obtained, **including any data generated** from field screening and/or field measurements. Please note that regulatory **actions under such laws** (and corresponding regulations) as RCRA, CERCLA, Safe Drinking Water Act, LUST, **State regulatory authorities**, the Clean Water Act, the Clean Air Act, may sometimes dictate the implementation of certain analytical methods, quality control, and chain-of-custody procedures. If possible, the intended data usages should be presented in tabular format.

These may include, but are not limited to, the following:

1. Qualitative or semi-quantitative analyses for selection of sample and/or sampling locations;

2. Future enforcement actions;

3. Data for remedial action alternatives;

4. Determination of hazardous waste characteristics for remedial removals;

5. Protection of Public Health;

6. Definition of extent of environmental contamination.

In addition to the rationale for target compounds and parameters, there should be a Sample Network and Rationale presented in the QAPP. At a minimum, inclusion of, or elaboration on, the following items is required:

1. Diagrams or site maps showing sampling locations;

2. Thorough rationale for selected sampling locations;

3. Summary table listing matrices, field and laboratory parameters, and their frequency of collection;

4. A categorized listing of matrix types to be encountered;

5. Any field screening to be performed;

6. Any field measurements to be performed;

7. Any measurements to be performed in conjunction with hydrogeologic investigations;

8. Ambient monitoring of media at the facility subject to investigation; and

9. Pertinent regulatory requirements.

Please note that for RCRA purposes when groundwater sampling is to be conducted for metals analyses, the QAPP must specify the procedures for collection of both field filtered and unfiltered samples. Furthermore, soil samples shall not be composited.

A **Project Schedule**, providing a description of dates anticipated for project initiation, milestones, and completion of the project as well as monitoring activities shall be provided. A milestone table or a bar chart consisting of project tasks and time lines is appropriate for this purpose.

SECTION 1

PROJECT DESCRIPTION

1.0 Project Description

This project description outlines the overall scope of an investigation to be performed in accordance with pertinent permit requirements for a permit issued on a specific date. This QAPP presents the organization, objectives, planned activities, and specific QA/QC procedures associated with the RFI for this facility. Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses will be described. All QA/QC procedures will be structured in accordance with applicable technical standards, U.S. EPA's requirements, regulations, guidance, and technical standards. This QAPP was prepared in accordance with a guidance manual entitled, "Region 5 Model RCRA Quality Assurance Project Plan", May, 1993.

1.1 Introduction

In this section, the overall scope of this project plan shall be described. Current status and QAPP preparation guidelines shall be explained. This QAPP has been prepared in behalf of [the facility] by (the contractor). A Project Management Plan, a QAPP, and a Health and Safety Plan have been appended to the RFI Workplan, dated_____. A Field Sampling Plan has also been prepared, which has been entirely incorporated into the QAPP through specific reference.

1.1.1 Overall Project Objectives

The purpose of the RFI is to gather sufficient information to quantify risk to public health and environment (Baseline Risk Assessment) and to consider possible remedial alternatives (Corrective Measures Study at the Site). The objectives of the RFI are to determine the nature and extent of contamination at the facility.

Objectives of the data collection will be as follows:

- o Verify and further define the nature and extent of contamination in previously identified on-site and off-site areas. Data quality must be sufficient to be able to compare with State health-based criteria, and other Federal regulatory criteria that are pertinent, (e.g. TSCA rules for PCBs, and RCRA).

- o Determine the nature and extent of contamination in previously uninvestigated areas. Data will eventually be compared to State and Federal regulatory criteria. [Please include a Table indicating what the pertinent criteria are.]

- o Collect sufficient data on all contaminated media to support a baseline risk assessment and feasibility study.

1.1.2 Project Status/Phase

[The Contractor] will utilize an integrated and phased approach for the RFI. During the RFI, data collection will be conducted in phases, with the results of the baseline risk assessment being a determining factor in decisions regarding the necessity for additional phases of investigation. The Phase I investigation will integrate existing data with information that will be gathered through direct field investigations.

The Phase I field investigation will include:

- o Surface soil (0 to 18 inches) sampling for verification and site characterization both on- and off-site;

- o Subsurface soil sampling along existing and previously excavated sewer lines, and in areas where deeper soil removals have occurred;

- o Groundwater sampling;

- o Residential well sampling;

- o Sediment and surface water sampling; and

- o In-situ permeability testing of aquifer materials.

Samples will be analyzed for volatile organics, organic extractables, pesticides/PCBs and/or metals. A limited number of samples will also be analyzed for cation exchange capacity (CEC), Atterburg limits, percent moisture, grain size distribution, and total organic carbon (TOC) to determine soil physical parameters and their effect on contamination migration. A limited number of samples will also be analyzed for the Toxicity Characteristic Leaching Procedure (TCLP) to characterize the waste for disposal. Soil pH tests will be conducted on a selected number of samples at the field screening laboratory.

Data from the Phase I investigation will be qualitatively and statistically evaluated in conjunction with existing data to determine whether a Phase II investigation is necessary. The rationale and scope of any Phase II investigation will be discussed with and approved by the U.S. EPA prior to implementation.

Potential Phase II work may include:

- o Additional soil/sediment sampling;
- o Asbestos sampling;
- o Installation of additional monitoring wells and a detailed groundwater investigation; and,
- o Treatability studies or pilot testing.

If Phase I data suggests that sufficient site characterization information has been collected [the Contractor] will proceed with the risk assessment for the site. A technical memorandum, presenting the Phase I data and recommendations of the risk assessment will be prepared and submitted to the U.S. EPA. After a review of the technical memorandum, the need for implementing a Phase II investigation will be evaluated in light of the data requirements for the feasibility study.

1.1.3 QAPP Preparation Guidelines

As explained above, this QAPP has been prepared in accordance with the "Region 5 Model RCRA Quality Assurance Project Plan", dated, May, 1993. Furthermore, in meetings held with the U.S. EPA in which the Region's protocol for presentation of QAPPs, additional guidance was received on how to prepare this QAPP. One of these meetings was a formal "pre-QAPP" meeting, and discussions held prior to the pre-QAPP meeting which focused on project scoping. At all meetings, representatives from the U.S. EPA's Environmental

Sciences Division were present and available for consultation.

1.2 Site/Facility Description

A brief description of the facility, its geological setting, and associated features is presented in the section below.

1.2.1 Location

The [RCRA Facility] is an inactive lead-acid battery manufacturing operation located in [facility, County, State]. The facility occupies approximately 18 acres on U.S. Highway [facility address] northwest of the city of [City], along the eastern bank of the [River name] River [Please provide a Map]. The facility is bordered on the north by [Street Name] Street, on the south by [Street Name] Street, on the west by a State Highway garage and on the east by the parking lot of a local inn. The study area for the [site name] RFI includes the [site name] property and off-site areas immediately surrounding the site.

1.2.2 Facility/Size and Borders

This section is addressed on pages ____ through ____ of the RFI Workplan, which is herein incorporated into this QAPP through reference, and in the drawings which have been submitted along with the RFI Workplan.

1.2.3 Natural & Manmade Features

This section is addressed on pages ____ through ____ of the RFI Workplan, which is hereby incorporated into this QAPP through reference.

1.2.4 Topography

See sections _____ of the RFI Workplan for information concerning the site's general topography.

1.2.5 Local Hydrology & Hydrogeology

See sections _____ of the RFI Work Plan for information concerning the site's physical features, population and land use, geology and soil, groundwater resources and surface hydrology and drainage.

1.3 Site/Facility History

1.3.1 General History

The facility was established in [Date] to manufacture lead acid batteries, primarily for cars and trucks, first by the [Historic Facility Names] Corporation and then by the [xxx] Corporation, which used the name [xxx] when it bought the facility from [xxx] in [Date]. [xxx] acquired the [xxx] Company in [year].

Over the years of operation, successive industrial sewer lines became plugged with lead sludge. The plugged line was typically left in place and a new line was installed. As a result of leaks and sewer line backups, the soils around some of these sewers and associated sumps were found to be contaminated with lead. The upper soils around the holding lagoon also showed elevated levels of lead. Other contaminants of concern are PCBs that were found in the soil around the transformer pad, the nearby water tower pad, and below a section of the main process building (see Figure xxx).

During normal plant operation, manufacturing process wastes and wastewater became laden with lead, lead oxides, sulfuric acid, and lead sulfates. The plant's ventilation system and processes released air laden with lead contaminants to the atmosphere around the facility [reference report]. Prior to 1978, wastewater was sent through the on-site industrial sewer system, then directly to the [City/County/etc.] sanitary sewer system. Beginning in [Date], wastewater effluent was subject to pH treatment on-site followed by placement into a wastewater sedimentation lagoon. Overflow from the lagoon went to the [Name] Publicly Owned Treatment Works.

Soil on and in the vicinity of the facility has been contaminated with lead, predominantly from airborne particulates. Malfunctions and accidental spills have also contributed to contamination of on-site soils with high concentrations

1.3.2 Past Data Collection Activities

The [site name] has been subject to a number of investigations since [Date]. The following summaries are based on a review of reports and supporting documents submitted by consultants and information obtained from the project files of the U.S. EPA and the State.

Beginning in [Date], [Company name] has contracted with [contractor names], to assess the degree of contamination at the facility, and evaluate remedial actions for the identified contamination problems. These include the contaminated surface soils both on-site and in certain off-site areas, the plugged sewer lines, the pH treatment system and surrounding soils, and the PCB contamination.

Pursuant to these studies more then 7,000 cubic yards of lead and PCB-contaminated soil have reportedly been removed from on and off-site [Previous study reference]. The clean up standard was to remove all lead-contaminated soil down to a level below 1000 ppm, as recommended and approved by the State. This standard was coupled with a requirement to lime all remaining soils where lead levels exceeded 250 ppm in order to maintain a soil pH greater than 7.0 and thereby reduce the mobility of the lead still in the soil. Soils contaminated with PCBs were removed from the facility in two separate actions. In the first action, PCB soils were reportedly removed down to a level below 50 ppm [Previous study reference]. In the second action, soils were removed to a level below 10 ppm [Previous study reference]. Verification samples following removal actions will be taken in accordance with this QAPP.

1.3.3 Current Status

Based on reports and documents reviewed for the site, and a current assessment of all available information, the following target compounds and source area release mechanisms have been targeted for further investigation.

- Past Facility Operations. Records indicate that during the active period of battery manufacture, the plant's ventilation system and processes released lead-laden air and possibly other contaminants to the atmosphere. Malfunctions and accidental spills also may have released both organic and inorganic contaminants to the environment. Other metals which may have been released along with lead include; antimony, arsenic, tin, calcium, strontium, tellurium, and barium. Organic chemicals that were used at the facility identified from RCRA documentation, include: trichloroethane, methylene chloride, paint thinner, epoxy resin, refined coal tar, and lubricant containing trichloroethylene.

- Wastewater Sewers. During plant operations, manufacturing process wastewater, containing lead oxides, lead sulfates, sulfuric acid, and possibly other metals was sent through the industrial sewer system to be discharged to the [City] publicly owned treatment works (POTW). After [Date], wastewater was subject to pH adjustment and sedimentation prior to discharge to the POTW. Documents indicate that as

industrial sewers became plugged with lead, they were left in place and new sewer lines were installed adjacent to the old. Reports indicate the soils around some of the sewer lines were heavily contaminated with lead, suggesting leaks. Other reports indicate that plugged sewers caused wastewater to back up in sumps and manholes causing wastewater releases to the ground surface.

- Surface Impoundment. The surface impoundment located in the southwest corner of the facility received pH adjusted wastewater for sedimentation. Documents indicate concerns over cracks in the concrete lining and the integrity of joints in the concrete construction. Concerns regarding overtopping of the impoundment have also been reported. Sample analysis of the sludge which settled in the wastewater lagoon indicates that high levels of waste lead, iron, aluminum, arsenic, barium, and calcium were generated during the manufacturing process.

- PCB Transformers. Records indicate that two PCB transformers located near the northwest corner of the facility leaked, releasing contaminated dielectric fluid to surrounding soils.

The historical release of contaminants as described above resulted in the contamination of on- and off-site soils and potentially the [Facility] facility and nearby buildings. Although significant attempts have been made to remediate the contamination i.e., on- and off-site soil removal, sewer excavations, etc., potentially significant concentrations of lead may remain in soils even though the primary sources have been removed. At this time, these soils constitute a secondary source of contamination, potentially affecting human and environmental targets in the area of the site. Similarly, lead contamination in on- and off-site structures may present a continuing exposure point for workers, residents, and visitors to the area.

1.4 Project Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of data required to support decisions made during RI/FS activities and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are at least five analytical levels which address various data uses and the QA/QC effort and methods required to achieve the desired level of quality.

1.4.1 Specific Objectives and Associated Tasks

For this project, it will be necessary to gather sufficient information to evaluate the nature

and extent of releases from _____ solid waste management units, and also to determine whether unreasonable health risks are associated by the _____ areas. This could include evaluation of the impact of releases on human health and the environment both within and beyond the facility property boundary, if applicable.

The specific objectives of the data collection at the [Facility name] are as follows:

Some field monitoring will be utilized for purposes of screening for "hot spot" areas and for worker health safety. Site characterization to locate areas for subsequent and more accurate analyses will be conducted. These types of data include those generated on-site through the use of HNu, pH, conductivity, and other real-time monitoring equipment at the site. The field data requirements are summarized in the submitted table.

In order to assess the presence or absence of hazardous constituents at the _____ and the _____, soil samples will be screened during this Phase I RFI for likely contaminants of concern, including volatile organics, organic extractables, pesticides/PCBs and (both) total and TCLP metals. In the event that metals are found to exceed TCLP action levels in soil or sediment, then any excavated soil will be regarded as hazardous waste by characteristic. A limited number of samples will also be analyzed for cation exchange capacity (CEC) and other soil characteristics. Groundwater samples will also be tested for the parameters indicated in the laboratory (with exception of CEC & other soil properties). This information will be used to compare results to representative background soil characteristics. If detectable low levels of constituents are identified, then the values shall be subject to a risk assessment study to be sent to the U.S. EPA at the conclusion of the study. This risk assessment shall be prepared according to guidance contained in a document, "Guidance for Data Useability in Risk Assessment", (EPA/540/G-90/008), October, 1990. For purposes of performing the risk assessment study, levels of undetected contaminants shall be assumed to be present at concentrations equal to 1/2 of the respective measured method detection limits. If the risk assessment results appear favorable, then the need for Phase II may be obviated, and [Facility name] will seek the "No Action Alternative" option through a modification to its RCRA permit.

In order to accomplish these goals, a confirmational level of analytical quality is needed. This provides the highest level of data quality and includes, but is not limited to the purposes of risk assessment, evaluation of remedial alternatives and establishing cleanup levels. These analyses require full documentation of SW 846 analytical methods, sample preparation steps, data packages and data validation procedures necessary to provide defensible data. Quality Control must be sufficient to define the precision and accuracy of these procedures at every step.

If the data generated during Phase I does not support the case for the "No Action Alternative", then a second planned Phase of activity will begin subject to an approved modification to this QAPP.

1.4.2 Project Target Parameters and Intended Data Usages

The list of target parameters for this project is included in (the Appendix to this Model QAPP). Intended data usages are to screen for Phase I analytes. The data shall be compared to background soil levels, or to measured detection limits and other (low level) health based criteria with the ultimate objective being to develop a risk assessment study. Data may also be used to assess feasability of using certain remediation technologies if contamination is found to exist. However, it is understood that a QAPP modification to allow bench scale testing of a remediative process, or simply to allow further evaluation of remediative process feasability may be required.

1.4.2.1 Field Parameters

The intended field parameters are stated in (the Appendix to this Model QAPP).

1.4.2.2 Laboratory Parameters

The intended laboratory parameters are stated in (the Appendix to this Model QAPP).

1.4.3 Data Quality Objectives

The intended data quality objectives for this project are summarized in (the Appendix to this Model QAPP).

1.5 Sample Network Design and Rationale

The sample network design and rationale for sample locations (in respective media) is fully described in detail in section _____ of the Field Sampling Plan. Rationale for why certain groups or classes of hazardous constituents listed in 40 CFR Part 261, Appendix IX, will not be analyzed during Phase I is also described in the Field and Sampling Plan.

1.5.1 Sample Network by Task and Matrix

Sample matrices, analytical parameters and frequencies of sample collection can be found in

(the Appendix to this Model QAPP).

1.5.2 Site Maps of Sampling Locations

Maps showing intended soil, sediment and surface water sampling locations are included as Figures in the Field Sampling Plan, which is fully incorporated into this QAPP through reference. It is possible, however, that depending on the nature of encountered field conditions some of these locations will be changed. The person who shall be responsible for making such decisions will be the Site Field Manager whose responsibilities are described in Section 2 of this QAPP. Locations of monitoring and residential wells to be sampled, with associated screen depths is also indicated in the Field Sampling Plan.

1.5.3 Rationale of Selected Sampling Locations

The rationale for why the selected sampling locations (and depths) were chosen in conjunction with each solid waste management unit and area of concern is fully described in the Field Sampling Plan, along with statistical arguments supporting the number of samples to be taken. (e.g. A total of seven background soil samples shall be taken to fully characterize background conditions with respect to each parameter, at a statistically high level of confidence.)

1.5.4 Sample Network Summary Table

The sample network for this project is presented in tabular format in the Field Sampling Plan (and in the Appendix to this Model QAPP).

1.6 Project Schedule

1.6.1 Anticipated Date of Project Mobilization

The earliest date for which samples are planned to be collected is _____. However, as indicated in the submitted Task Bar Chart, some activities such as installation of monitoring wells are scheduled to begin on _____.

1.6.2 Task Bar Chart and Associated Timeframes

The dates of projected milestones are indicated in the submitted Task Bar Chart.

QAPP ELEMENT 4

PROJECT ORGANIZATION AND RESPONSIBILITY

This element will include the following sections:

1) Management Responsibilities

All managers who will have some responsibility in this project will be stated and their responsibilities will be specifically defined. This includes the facility, their contractors, U.S. EPA, and State management (if applicable).

2) QA Responsibilities

The responsibilities of all QA personnel involved in this project will be stated by position and their responsibilities will be delineated. As part of the detail of this section, the QA personnel responsible for the following will be specified:

a) data validation

b) data assessment

c) internal performance and system audits

3) Field Responsibilities

The responsibility of the field personnel will be outlined in this section. Included in this section will be the person responsible for identifying and documenting nonconformances through corrective action.

4) Laboratory Responsibilities

Laboratory responsibilities will be outlined in this section. This includes stating the location of the laboratory (city and state) and listing the analytes and matrices that will be tested at the laboratory. Any lab staff with responsibility during this project will have those duties stated (e.g. lab sample custodian, etc.).

5) Project Organization Diagram

This diagram will include ALL personnel (no more, no less) discussed in the text and will show the lines of authority and communication.

Examples of the level of detail necessary are provided in the example that follows. Any information inside square brackets ([]) denotes replacing this information with facility and/or contractor-specific names or information.

SECTION 2

PROJECT ORGANIZATION AND RESPONSIBILITY

[The example language for this section includes a wide variety of types of individual responsibilities. In writing a QAPP, you may use or modify whichever of the following examples are applicable to your project.]

At the direction of the [U.S. EPA RCRA Permit Writer/RCRA Project Coordinator(RPC)/State Project Manager], [Contractor] has overall responsibility for all phases of the RFI/CMS. [Contractor/Facility] will perform the field investigation, prepare the RFI report, and perform the subsequent CMS. Project management will also be provided by [Contractor/Facility]. The various quality assurance, field, laboratory and management responsibilities of key project personnel are defined below.

2.1 Project Organization Chart

The lines of authority for this specific project can be found in Figure 2-1. This chart includes all individuals discussed below.

2.2 Management Responsibilities

U.S. EPA RCRA Permit Writer/RCRA Project Coordinator/State Project Manager

The [U.S. EPA RCRA Permit Writer (RPW)/RCRA Project Coordinator (RPC)] has the overall responsibility for all phases of the RFI/CMS. The State Project Manager has overall responsibility for all phases of the RFI/CMS with oversight by the U.S. EPA [RPC/RPW].

[Facility] Project Manager

The [Facility] project manager is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements. The [Facility] manager's primary function is to ensure that technical, financial, and scheduling objectives are achieved successfully. The [Facility] project manager will report directly to the [U.S. EPA Region 5 RPW/RPC/State Project Manager] and will provide the major

point of contact and control for matters concerning the project. The [Facility] project manager will:

o Define project objectives and develop a detailed work plan schedule;

o Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task;

o Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule constraints;

o Orient all field leaders and support staff concerning the project's special considerations;

o Monitor and direct the field leaders;

o Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product;

o Review the work performed on each task to ensure its quality, responsiveness, and timeliness;

o Review and analyze overall task performance with respect to planned requirements and authorizations;

o Approve all reports (deliverables) before their submission to U.S. EPA Region 5;

o Ultimately be responsible for the preparation and quality of interim and final reports; and

o Represent the project team at meetings and public hearings.

[Contractor] Project Manager

The [Contractor] project manager has overall responsibility for ensuring that the project meets U.S. EPA's objectives and [Contractor] quality standards. The [Contractor] project manager will provide assistance to the [Facility] project manager in terms of writing and distributing the QAPP to all those parties connected with the project (including the

laboratory). The [Contractor] project manager will report directly to the [Facility] project manager and is responsible for technical quality control and project oversight.

2.3 Quality Assurance Responsibilities

[Facility] QA Manager

The [Facility] QA manager will remain independent of direct job involvement and day-to-day operations, and have direct access to corporate executive staff as necessary, to resolve any QA dispute. He/she is responsible for auditing the implementation of the QA program in conformance with the demands of specific investigations, [Contractor's] policies, and U.S. EPA requirements. Specific functions and duties include:

- o Providing QA audit on various phases of the field operations;
- o Reviewing and approving of QA plans and procedures;
- o Providing QA technical assistance to project staff;
- o Reporting on the adequacy, status, and effectiveness of the QA program on a regular basis to the program manager and executive vice president for technical operations.

[Contractor] QA Manager

The [Contractor] QA manager reports directly to the [Contractor] project manager and will be responsible for ensuring that all [Contractor] procedures for this project are being followed. In addition, the [Contractor] QA manager will be responsible for the data validation of all sample results from the analytical laboratory.

U.S. EPA Region 5 Quality Assurance Manager (RQAM)

EPA RQAM has the responsibility to review and approve all Quality Assurance Project Plans (QAPPs). Additional U.S. EPA responsibilities for the project include:

- o Conducting external Performance and System Audits of RFI Laboratory

o Reviewing and evaluating analytical field and laboratory procedures

2.4 Laboratory Responsibilities

[Laboratory] Project Manager

The [Laboratory] project manager will report directly to the [Contractor] project manager and will be responsible for the following:

- o Ensuring all resources of the laboratory are available on an as-required basis; and
- o Overviewing of final analytical reports.

[Laboratory] Operations Manager

The [Laboratory] operation manager will report to the [Laboratory] Project Manager and will be responsible for:

- o Coordinating laboratory analyses;
- o Supervising in-house chain-of-custody;
- o Scheduling sample analyses;
- o Overseeing data review;
- o Overseeing preparation of analytical reports; and
- o Approving final analytical reports prior to submission to [The Contractor/Facility].

[Laboratory] Quality Assurance Officer

The [Laboratory] QA officer has the overall responsibility for data after it leaves the laboratory. The [Laboratory] QA officer will be independent of the laboratory but will communicate data issues through the [Laboratory] project manager. In addition, the [Laboratory] QA officer will:

- o Overview laboratory quality assurance;
- o Overview QA/QC documentation;
- o Conduct detailed data review;
- o Determine whether to implement laboratory corrective actions, if required;
- o Define appropriate laboratory QA procedures;
- o Prepare laboratory Standard Operation procedures; and
- o Sign the title page of the QAPP.

[Laboratory] Sample Custodian

The [Laboratory] sample custodian will report to the [Laboratory] operations manager. Responsibilities of the [Laboratory] sample custodian will include:

- o **Receiving** and inspecting the incoming sample containers;
- o **Recording** the condition of the incoming sample containers;
- o Signing appropriate documents;
- o Verifying chain-of-custody and its correctness;
- o Notifying laboratory manager and laboratory supervisor of sample receipt and inspection;

o Assigning a unique identification number and customer number, and entering each into the sample receiving log;

o With the help of the laboratory manager, initiating transfer of the samples to appropriate lab sections; and

o Controlling and monitoring access/storage of samples and extracts.

Final responsibility for project quality rests with [Contractor's] Project Manager. Independent quality assurance will be provided by the [Laboratory] Project Manager and QA Officer prior to release of all data to [Contractor/Facility].

[Laboratory] Technical Staff

The [Laboratory] technical staff will be responsible for sample analysis and identification of corrective actions. The staff will report directly to the [Laboratory] operations manager.

2.5 Field Responsibilities

[Contractor/Facility] Field Leader

The [Facility] project manager will be supported by the [Facility/Contractor] field team leader. He/she is responsible for leading and coordinating the day-to-day activities of the various resource specialists under his/her supervision. The [Facility/Contractor] field team leader is a highly experienced environmental professional and will report directly to the [Facility] project manager. Specific field team leader responsibilities include:

o Provision of day-to-day coordination with the [Facility] project manager on technical issues in specific areas of expertise;

o Developing and implementing of field-related work plans, assurance of schedule compliance, and adherence to management-developed study requirements;

o Coordinating and managing of field staff including sampling, drilling, and supervising field laboratory staff;

o Implementing of QC for technical data provided by the field staff including field

measurement data;

o Adhering to work schedules provided by the project manager;

o Authoring, writing, and approving of text and graphics required for field team efforts;

o Coordinating and overseeing of technical efforts of subcontractors assisting the field team;

o Identifying problems at the field team level, resolving difficulties in consultation with the [Facility] project manager, implementing and documenting corrective action procedures, and provision of communication between team and upper management; and

o Participating in preparation of the final report.

[Laboratory] On-Site Laboratory Manager [if applicable]

The on-site laboratory manager is responsible for leading and coordinating the day-to-day laboratory activities. Specific on-site laboratory manager responsibilities include:

o Providing day-to-day coordination with the RFI field team leader on technical issues in specific areas of expertise;

o Implementing QC for analytical data;

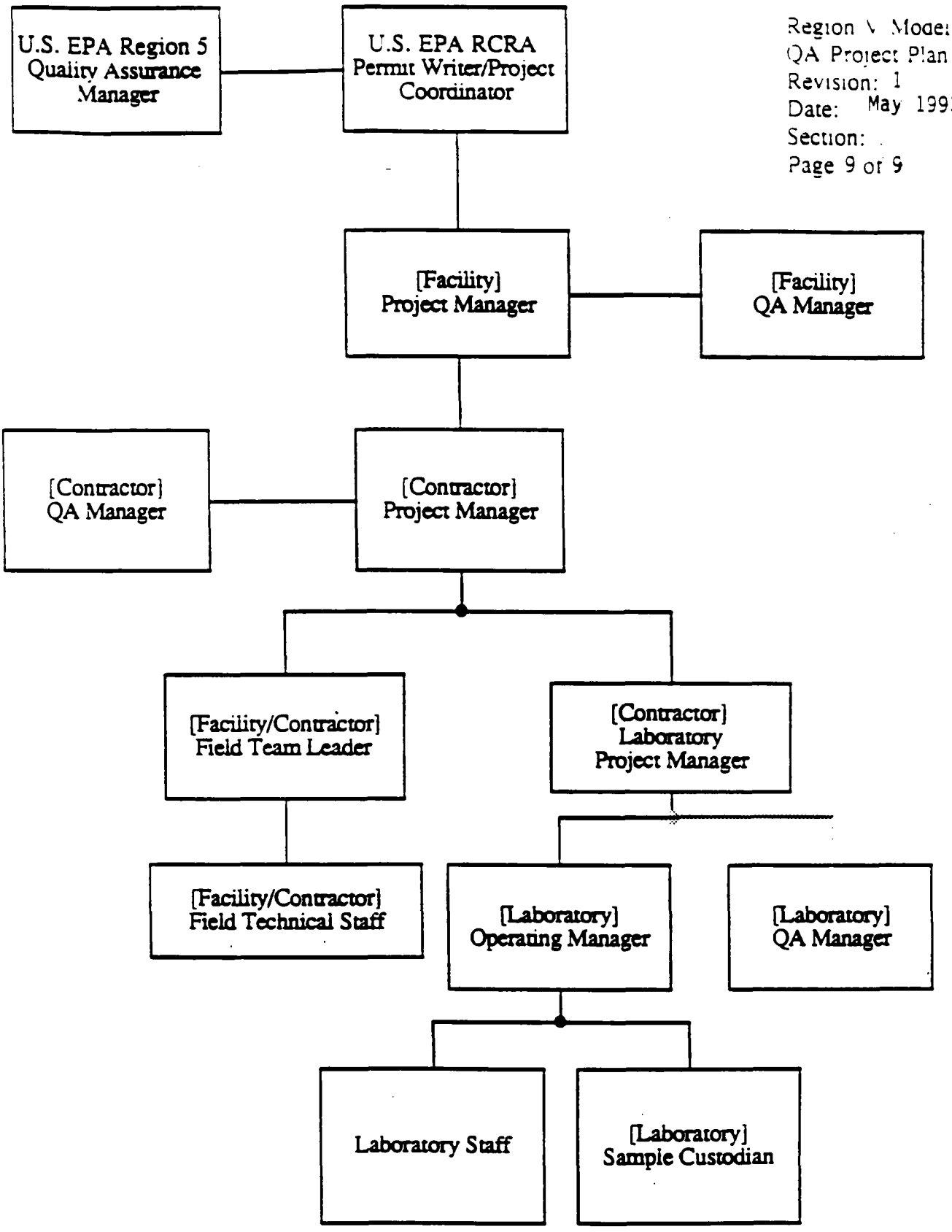
o Identifying problems at the laboratory level and discussing and documenting resolutions with the field team leader.

[Contractor] Field Technical Staff

The technical staff (team members) for this project will be drawn from [Contractors's] pool of corporate resources. The technical team staff will be utilized to gather and analyze data, and to prepare various task reports and support materials. All of the designated technical team members are experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work.

[Laboratory] On-Site Lab Staff (if applicable)

The on-site laboratory staff will be responsible for maintaining all aspects of the laboratory to meet the requirements outlined in this QAPP. They will also be responsible for notifying the field team leader when nonconformances are noticed and when corrective action is warranted.



LINE OF AUTHORITY

LINE OF COMMUNICATION

FIGURE 2-1 PROJECT ORGANIZATION DIAGRAM

QAPP ELEMENT 5

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The purpose of this section is to address project-specific objectives for accuracy, precision, completeness, representativeness, and comparability.

This section will include the following:

1) Discussion of Quantitative QA Objectives

a) Summary Tables

- A table will have the QA limits required for the project (Project Quantitation Limits, PQLs). Also, this table will include the laboratory method detection limits. If this table is presented in the Project Description section, then a reference to that section will be given.

- A table of control limits will be supplied in this section. The control limits for all QC samples (e.g. matrix spikes/matrix spike duplicates, surrogates, etc.) for all analytes to be quantitated will be stated.

b) Precision - The definition for precision and a description of how precision will be assessed for field and laboratory measurements will be presented.

c) Accuracy - The definition for accuracy and a description of how accuracy will be assessed for field and laboratory measurements will be presented.

d) Completeness - The definition of completeness along with the percent of completeness to be obtained for the project will be stated for both field and laboratory analyses.

2) Discussion of Qualitative QA Objectives

a) Representativeness - The measures to be employed to ensure representativeness for field and laboratory measurements will be stated.

b) Comparability - The measures to be employed to ensure comparability for field and laboratory measurements will be stated.

SECTION 3

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective for this project is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results which are legally defensible in a court of law. Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP.

3.1 Precision

3.1.1 Definition

Precision is a measure of the degree to which two or more measurements are in agreement.

3.1.2 Field Precision Objectives

Field precision is assessed through the collection and measurement of field duplicates at a rate of 1 duplicate per 10 analytical samples. The total number of duplicates for this project are found in [the Appendix to this Model QAPP] of the project description section.

3.1.3 Laboratory Precision Objectives

Precision in the laboratory is assessed through the calculation of relative percent differences (RPD) and relative standard deviations (RSD) for three or more replicate samples. The equations to be used for precision in this project can be found in section 12 of this QAPP. Precision control limits are given in [the Appendix to this Model QAPP] and are referenced to the provided SOPs.

3.2 Accuracy

3.2.1 Definition

Accuracy is the degree of agreement between an observed value and an accepted reference value.

3.2.2 Field Accuracy Objectives

Accuracy in the field is assessed through the use of field and trip blanks and through the adherence to all sample handling, preservation and holding times.

3.2.3 Laboratory Accuracy Objectives

Laboratory accuracy is assessed through the analysis of matrix spikes (MS) or standard reference materials (SRM) and the determination of percent recoveries. The equation to be used for accuracy in this project can be found in section 12 of this QAPP. Accuracy control limits are given in [the Appendix to this Model QAPP] and are referenced to the provided SOPs.

3.3 Completeness

3.3.1 Definition

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

3.3.2 Field Completeness Objectives

Field completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in section 12 of this QAPP. Field completeness for this project will be greater than 90 percent.

3.3.3 Laboratory Completeness Objectives

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in section 12 of this QAPP. Laboratory completeness for this project will be greater than 95 percent.

3.4 Representativeness

3.4.1 Definition

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

3.4.2 Measures to Ensure Representativeness of Field Data

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the field sampling plan (FSP) is followed and that proper sampling techniques are used.

3.4.3 Measures to Ensure Representativeness of Laboratory Data

Representativeness in the laboratory is ensured by using the proper analytical procedures, meeting sample holding times and analyzing and assessing field duplicated samples. The sampling network was designed to provide data representative of facility conditions. During development of this network, consideration was given to past waste disposal practices, existing analytical data, physical setting and processes, and constraints inherent to the RCRA program. The rationale of the sampling network is discussed in detail in the field sampling plan (FSP).

3.5 Comparability

3.5.1 Definition

Comparability is an expression of the confidence with which one data set can be

compared with another.

3.5.2 Measures to Ensure Comparability of Field Data

Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the FSP is followed and that proper sampling techniques are used.

3.5.3 Measures to Ensure Comparability of Laboratory Data

Planned analytical data will be comparable when similar sampling and analytical methods are used and documented in the QAPP. Comparability is also dependent on similar QA objectives.

3.6 Level of Quality Control Effort

Field blank, trip blank, method blank, duplicate, standard reference materials (SRM) and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs.

Field and trip blanks consisting of distilled water, will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Field blank samples are analyzed to check for procedural contamination at the facility which may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage.

Method b[redacted]ples are generated within the laboratory and used to assess contamination resulting [redacted]oratory procedures. Duplicate samples are analyzed to check for sampling and analyt[redacted]producibility. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. All matrix spikes are performed in duplicate and are hereinafter referred to as MS/MSD samples. One matrix spike/matrix spike duplicate will be collected for every 20 or fewer investigative samples. MS/MSD samples are designated/ collected for organic analyses only.

MS/MSD samples are investigative samples. Soil MS/MSD samples require no extra volume for VOCs or extractable organics. However, aqueous MS/MSD samples must be collected at triple the volume for VOCs and double the volume for extractable organics. One MS/MSD sample will be collected/designated for every 20 or fewer investigative samples per sample matrix (i.e., groundwater, soil).

The general level of the QC effort will be one field duplicate and one field blank for every 10 or fewer investigative samples. One volatile organic analysis (VOA) trip blank consisting of distilled deionized ultra pure water will be included along with each shipment of aqueous VOA samples.

The number of duplicate and field blank samples to be collected are listed in [the Appendix to this Model QAPP]. Sampling procedures are specified in the Field Sampling Plan.

QAPP ELEMENT 6

SAMPLING PROCEDURES

This section will provide detailed, stepwise sampling procedures for each matrix (soil borings, sediment, surface water, groundwater, air, biota, etc.) to be evaluated. A matrix will be defined as a unique stratum which may be solid, liquid, gaseous, animal, or vegetable. Solid matrices may be similar (i.e. soil boring and sediment) but are considered separate matrices. Each sampling procedure will specify:

1) All equipment necessary to sample the matrix,

2) Detailed, "cookbook" procedures to collect investigative samples,

3) Explicit instructions for collecting each applicable type of QC sample for each matrix and associated analytical parameter. These QC samples will include field duplicates, field blanks, trip blanks (for aqueous volatile samples), matrix spike, matrix spike duplicates, etc.,

4) The order of analytical parameter sample fraction collection (i.e. "volatiles first, followed by extractable organics...") for each matrix,

5) Sample containers for each analytical fraction, matrix type, and concentration level. Specifically, the following will be addressed:

   a) The type of container

   b) The container volume

   c) The number of containers required for each analysis

   d) Specific chemical/temperature preservations required

6) Obtaining contaminant-free sample containers. Specifically, the following will be addressed:

   a) Detailed procedures used to prepare contaminant-free sample containers for each container/analytical fraction type,

   b) The criteria all containers must meet (i.e. "benzene < 1 ppb," etc.)

   c) How the criteria are verified and the frequency of the verification (i.e. "{Laboratory} will conduct a GC/MS analysis using CLP OLM01.8 at a frequency of one volatile and semivolatile container perlot of 100 sample containers.")

   d) Who will prepare the containers (i.e. "Containers will be prepared by [Sample Container Company].)"

   e) How the criteria are documented (i.e. "[Sample Container Company] will provide a certified analysis for each sample container lot.")

7) Decontamination procedures for field equipment,

8) Any ancillary procedures such as monitoring well installation or hydropunch work,

9) Sample packaging and shipping procedures to be used as part of the field chain-of-custody procedures since many considerations of sample shipping are integral to custody.

NOTE: If a Field Sampling Plan (FSP) is being prepared, the information to be supplied in the QAPP can be referenced to the FSP. However, the information in the FSP must 1) address ALL requirements stated in this section, 2) provide very detailed information, and 3) provide the specific reference to the FSP where the requested information is located. If these criteria cannot be met by the FSP, then this information must be detailed in this section of the QAPP.

SECTION 4

SAMPLING PROCEDURES

[The following is an example of a sampling procedures section where a Field Sampling Plan (FSP) has been prepared. If a FSP is not prepared, this information must be stated in this section.]

The sampling procedures to be used in this site investigation will be consistent for the purpose of this project. The field sampling plan outlines all the sampling procedure information. Please refer to the following sections and subsections of the FSP for the following information:

- Groundwater Monitoring Well Installation - Section 2.1
- Groundwater Monitoring Well Equipment - Section 2.2
- Groundwater Sampling Procedures - Section 2.3
- Sample Containers - Section 2.4
- Obtaining Contaminant-Free Sample Containers - Section 2.4.1
- QC Sample Procedures - Section 2.5
- Field Blank Collection - Section 2.5.1
- Field Duplicative Collection - Section 2.5.2
- Matrix Spike/Matrix Spike Duplicate Collection - Section 2.5.3
- Trip Blank Preparation - Section 2.5.4
- Groundwater Sampling Equipment Decontamination - Section 2.5.5
- Groundwater Sampling Order - Section 2.5.6

[NOTE: This reference orientation was presented for groundwater only. However, the same referencing would be applied to ALL matrices (i.e. soil, sediments, wipes, fish, etc.)]

QAPP ELEMENT 7

CUSTODY PROCEDURES

Chain of custody is defined as the sequence of persons who have the item in custody. Chain of custody will be demonstrated by documenting that the item in question was always in a state of custody. This will be accomplished through a combination of field and laboratory records that demonstrate possession and transfer of custody.

This section will provide detailed procedures for chain of custody for field activities, laboratory activities, and final evidence files as follows:

1) Field Custody Procedures

Detailed custody procedures will be stated for evidence collected in the field. All documents, logbooks, photographs, measurements, analyses, samples collected, etc. must be addressed in the field custody procedures. Detailed explanations will include:

- Procedures for transfer of custody between individuals.

- A sample numbering system (if not presented in another QAPP section).

- Sample packaging and shipment procedures to an off site laboratory.

- Chronological sequences and instructions for completing all field custody documents as well as copies of each document (as applicable):

  i. Field logbooks: The field logbook entry shall provide all information pertinent to the collection of field samples including locations, number/types of samples, measurements, sampling/atmospheric conditions, observations, etc. The field logbook will be a bound volume assigned to an individual field team member. All entries will be completed with a permanent inkpen with no erasures or whiteout used. All entries will be signed/dated. Any entry which is to be deleted shall use a single crossout which is signed/dated.

  ii. Sample tags: A sample tag is attached to each individual sample aliquot for each investigative or quality control sample. An example of a U.S. EPA sample tag with instructions for completion is found as a figure appended to this Model QAPP (see section entitled "chain of custody samples"). At a minimum, the tag will include the field sample number, location (if not already encoded in the sample number), date/time of collection and type of analysis. A space for lab sample number (provided by the lab upon log-in) is also required.

  A sample tag may be attached to the sample container with a wire around the container neck through a reinforced hole in the tag. All tag entries are made with a waterproof, permanent ink.

  While sample labels (described below) may be used in addition to tags, tags must always be used whenever chain of custody is required! The sample tag is the only physical evidence of the sample aliquot as carried through the entire custody process outside of keeping all sample containers. Sample labels cannot usually be removed intact and often do not include enough space for information on smaller containers.

Sample tags allow for disposal of sample containers once the samples have exceeded their holding times.

iii. Sample labels: As noted above, sample labels are optional when chain-of-custody is required. Sample labels may repeat some of the information provided on tags but usually cannot be removed intact.

iv. Chain of custody record form: A chain-of custody record form is the form used to record information pertinent to all samples being shipped in the same cooler. In general, the form will record samples which may be shipped together (i.e. extractable organics or metals) to the same laboratory. The form will also include spaces for transfers of custody by the field team as well as for log-in by the lab sample custodian.

v. Shipping cooler custody seals: Shipping cooler custody seals are placed on the edges of the cooler between the lid and sides to determine whether coolers may have been tampered with. The custody record form, along with all associated samples/tags, preservative (i.e., ice) and packing material are placed in the cooler prior to sealing with one or more seals.

vi. Airbills: Airbills used by the shipping company are often overlooked in the custody chain. Airbills are the only means to document and ensure continuity in custody between the shipment of samples from the field until their arrival at the laboratory. Copies of all completed airbills must be included as part of the final custody documentation.

2) Laboratory Custody Procedures

Detailed laboratory custody procedures specific to each laboratory associated with the project will be stated. The RCRA facility and its field contractor must ensure continuity between field and lab custody procedures. Laboratory custody procedures will:

- begin when samples are received by the laboratory.

- maintain the chain of custody initiated in the field.

- provide the chronological sequence from sample log-in through sample analysis and disposal.

- provide detailed log-in procedures.

- detail the internal sample tracking and numbering systems.

- identify the sample custodian.

- detail transfers of custody within the laboratory.

- provide examples of internal custody documents (with instructions for completion).

- specify how and where samples are stored.

- specify how and when samples, extracts, and digestates are disposed.

- specify how custody of analytical data are maintained.

- specify how analytical data and custody records are "purged" from the custody of the lab to the final evidence file.

3) Final Evidence Files: This section will specify:

- the contents of the final evidence file.

- the identification of the file custodian.

- the location where the file will be maintained in a secure, limited access area.

- the length of time (as mandated by U.S. EPA) that the file will be maintained. This may be specified in an order, etc. The file must be offered to U.S. EPA prior to disposal.

SECTION 5

CUSTODY PROCEDURES

Custody is one of several factors which is necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is under your custody if:

* the item is in actual possession of a person; or

* the item is in the view of the person after being in actual possession of the person; or

* the item was in actual physical possession but is locked up to prevent tampering; or

* the item is in a designated and identified secure area.

5.1 FIELD CUSTODY PROCEDURES

Field logbooks will provide the means of recording data collecting activities performed. As such, entries will be described in as much detail as possible so that persons going to the facility could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound, field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the document control center when not in use. Each logbook will be identified by the project-specific document number.

The title page of each logbook will contain the following:

* Person to whom the logbook is assigned.

* Logbook number.

* Project name.

* Project start date, and

* End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in ink, signed, and dated and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark which is signed and dated by the sampler. Whenever a sample is collected, or a measurement is made, a detailed description of the location of the station, which includes compass and distance measurements, shall be recorded. The number of the photographs taken of the station, if any, will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected following the sampling procedures documented in Section __ of this QAPP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume and number of containers. Sample identification number will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description.

The sample packaging and shipment procedures summarized below will ensure that the samples will arrive at the laboratory with the chain of custody intact. The protocol for specific sample numbering using case numbers and traffic report numbers if applicable and other sample designations are included in Section ___ of this QAPP. Examples of field custody documents and instructions for completion are presented in [Appendix to this Model QAPP].

a) The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched. As FEW people as possible should handle the samples.

(b) All bottles will be identified by use of sample tags with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample numbering system is presented in section ___ of this QAPP.

(c) Sample tags are to be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample tag because the ballpoint pen would not function in freezing weather.

d) Samples are accompanied by a properly completed chain of custody form. The sample numbers and locations will be listed on the chain of custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area.

(e) Samples will be properly packaged on ice at 4°C for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be locked and secured with strapping tape and custody seals for shipment to the laboratory. The preferred procedure includes use of a custody seal attached to the front right and back left of the cooler. The custody seals are covered with clear plastic tape. The cooler is strapped shut with strapping tape in at least two locations.

(f) Whenever samples are collocated with a government agency, a separate sample receipt is prepared for those samples and marked to indicate with whom the samples are being collocated. The person relinquishing the samples to the facility or agency should request the representatives signature acknowledging sample receipt. If the representative is unavailable or refuses to sign, this is noted in the "Received By" space.

(g) All shipments will be accompanied by the Chain of Custody Record identifying the contents. The original record will accompany the shipment, and the pink and

yellow copies will be retained by the sampler for returning to the sampling office.

(h) If the samples are sent by common carrier, a bill of lading should be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers are not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact.

(i) Samples will be transported to the laboratory the same day the samples are collected in the field by overnight carrier.

5.2 LABORATORY CUSTODY PROCEDURES

Laboratory custody procedures for sample receiving and log-in; sample storage and numbering; tracking during sample preparation and analysis; and storage of data are described in the [Laboratory] procedures in the appendix. Examples of laboratory chain of custody traffic reports along with instructions for completion are [included in the Appendix to this Model QAPP]. **[This laboratory information can be attached to the QAPP as an appendix and referenced. Otherwise, please list the procedures here.]**

5.3 FINAL EVIDENCE FILES

The final evidence file will be the central repository for all documents which constitute evidence relevant to sampling and analysis activities as described in this QA[illegible]Contractor] is the custodian of the evidence file and maintains the contents o[illegible]iles for the RFI, including all relevant records, reports, logs, field n[illegible]tures, subcontractor reports and data reviews in a secured, limited a[illegible]d under custody of the [Contractor] facility manager.

The final evidence file will include at a minimum:

- field logbooks

- field data and data deliverables

- photographs

- drawings
- soil boring logs
- laboratory data deliverables
- data validation reports
- data assessment reports
- progress reports, QA reports, interim project reports, etc.
- all custody documentation (tags, forms, airbills, etc.)

QAPP ELEMENT 8

CALIBRATION PROCEDURES AND FREQUENCY

This section will include a description of the calibration procedures and the frequency with which these procedures will be performed for both field and laboratory instruments. This section will include the following:

1) Field Instrument Calibration

- Initial calibration
- Continuing calibration

2) Laboratory Instrument Calibration

- Initial calibration for each instrument, 3 or 5 point calibration **[NOTE: The ICP only requires a 2-point initial calibration.]**
- Initial calibration verification
- Continuing calibration

Each calibration procedure will also include the acceptance criteria and the conditions that will require recalibration. The accuracy and traceability of the calibration standards used must be properly documented.

[NOTE: The SOPs for all the analyses that will be performed on the samples collected for this RFI will include a section on instrument calibration if the format described in "*Guidelines For The Preparation of Standard Operating Procedures (SOPs) For Field and Laboratory Measurements*" was followed. For details, refer to section 7 instructions page.]

[NOTE: Any deviation from the SOP must be explained and justified in this section. It must be specified whether the deviation to the SOP is only temporary for the purpose of this facility investigation. Otherwise, if the deviation is permanent, then the SOP will have to be revised and resubmitted to the EPA.]

SECTION 6

CALIBRATION PROCEDURES AND FREQUENCY

This section describes the calibration procedures and the frequency at which these procedures will be performed for both field and laboratory instruments.

6.1 Field Instrument Calibration

The field instruments will be calibrated as described in field SOPs. Field instruments include a pH meter, potentiometer for Eh measurement, thermometer, nephelometer, conductivity meter, field GC system, organic vapor analyzer (OVA) or organic vapor photoionization detector (PID). As a rule, instruments will be calibrated daily prior to use and will be recalibrated every **[number]** samples. For specific instructions on the calibration frequency, the acceptance criteria and the conditions that will require more frequent recalibration, refer to the specific SOPs for each field analysis.

The linearity of the instrument will be checked by using a 2-point calibration with reference standards bracketing the expected measurement. All the calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference standard used, temperature at which readings were taken and the readings. Multiple readings on one sample or standard, as well as readings on replicate samples, will likewise be documented.

[The following example calibration procedures for standard field measurements are acceptable and may be inserted verbatim into individual facility investigations QAPP, if applicable. The SOPs for these field measurements may also be referenced. Field instruments may vary by manufacturer in which case the instruction or operating manual should serve as a guide in preparing SOPs.]

pH Meter Calibration

The pH meter will be calibrated with standard buffer solutions before being taken to the field. In the field, the meter will be calibrated daily with two buffer solutions before use. The range of the buffer solutions will be at least three or more pH units apart and will bracket the expected pH of the sample being measured.

- Ensure that the temperature of sample and buffer are the same.
- Connect pH electrode into pH meter and turn on pH meter.
- Set temperature setting based on the temperature of buffer; place electrode in first buffer solution.
- After reading has stabilized, adjust "CALIB" knob to display correct value.
- Repeat procedure for second buffer solution.
- Place pH electrode in the sample and record the pH as displayed.
- Remove pH electrode from sample and rinse off with distilled water.
- Recalibrate the pH meter every time it is turned off and turned back on, or if it starts giving erratic results.

Thermometer Calibration

Temperature readings will be taken using thermometers which have been compared to NIST traceable thermometer. Prior to use, the thermometers will be inspected to ensure that there is no mercury separation and will be periodically checked in the field. The thermometers used will be calibrated against a NIST traceable reference thermometer by immersing both thermometers in a bath of an expected known temperature such as freezing (0 degrees C) or boiling (100 degrees C) and comparing the readings. If the error is more than [QC limit in percent], then the thermometer should be discarded and replaced.

Conductivity Meter Calibration

The conductivity/specific conductivity meter will be cleaned and checked against known conductivity standards before being taken to the field. In the field, the instrument will be checked daily with NIST [or other approved sources] traceable reference standards. The calibration procedure is described below:

- Place the probe in the conductivity calibration standard solution.
- Set temperature knob for temperature of standard solution.

* Turn to appropriate scale and set the instrument for the value of calibration standard.

* Rinse off the electrode with distilled water.

* Measure the conductivity for distilled water to be used for a field blank, making sure temperature is set correctly for temperature of solution to be tested.

* If the conductivity of blank (distilled water) is high, it must be discarded and a new blank sample obtained.

Organic Vapor analyzer (OVA), Organic Vapor Photoionization Detector (OV-PID) and HNU GC

The OVA will be checked daily by use of the internal calibration mechanism. The OV-PID will be calibrated daily with **[calibration gas, for example: methane]** of known concentration.

Geophysical Instrument Calibration

The calibration procedures and their frequency for geophysical instruments such as magnetometer, electromagnetic conductivity meter and ground penetrating radar equipment are described in an SOP.

6.2 Laboratory Instrument Calibration

Calibration procedures for a specific laboratory instrument will consist of initial calibration (3 or 5-points), initial calibration verification and continuing calibration verification. For a description of the calibration procedures for a specific laboratory instrument, refer to the applicable **SOPs** in [the Appendix to this Model QAPP] of this QAPP. The SOP for each analysis **performed** in the laboratory describes the calibration procedures, their frequency, acceptance **criteria** and the conditions that will require recalibration. In all cases, the initial calibration **will be** verified using an independently prepared calibration verification solution.
[NOTE: Any deviation from the SOP must be explained and justified in this section. It must be specified whether the deviation to the SOP is only temporary for the purpose of this facility investigation. Otherwise, if the deviation is permanent, then the SOP will have to be revised and resubmitted to the EPA.]

The laboratory maintains a sample logbook for each instrument which will contain the following information: instrument identification, serial number, date of calibration, analyst, calibration solutions run and the samples associated with these calibrations.

QAPP ELEMENT 9

ANALYTICAL PROCEDURES

This section will describe the field and laboratory analytical procedures to be used for the site investigation. Field analytical procedures are those procedures which generate analytical data to be used in a decision-making process involved with sample selection or site screening (e.g. field screening with a GC to determine particular constituent concentrations). Laboratory analytical procedures include organic and inorganic constituents as well as characteristic matrix concentrations (e.g. BOD, COD, TOC, TOX, TPH, etc.). These procedures will provide information for the purpose of meeting defined project objectives.

The following information will be stated in this section:

1) The analytical parameters and matrices to be tested will be stated for each laboratory involved in the project. Each laboratory address will be stated in this section of the QAPP. A reference to the specific section in QAPP Section 2 (Lab Responsibilities) is acceptable to satisfy this requirement.

2) Standard Operating Procedures for sample preparation (i.e. extraction, concentration, etc., for organics; digestion, dilutions, etc., for inorganics) and cleanup methods, for all types of matrices, if not included in the determinative SOPs will be stated in this section of the QAPP. Determinative SOPs are those that describe the qualitative/quantitative analysis of specific analyte groups which, may or may not include the sample preparation and cleanup of the extracts. For example, in *The Test Methods for Evaluating Solid Waste (SW-846)*, the sample preparation and cleanup methods are cited independent of the determinative instrumental methods.

3) Standard Operating Procedures (SOPs) for all analyses that will be performed on the samples collected from the site under investigation will be stated. The SOPs may be based on SW-846, or other EPA methods, such as those promulgated under the Clean Water Act (e.g. EPA 600 Series Organic Methods) and Safe Drinking Water Act (e.g. EPA 500 Series Methods) provided that the methods are sufficient to meet any defined project objectives. Some SOPs for inorganic analysis will be based on EPA-600/4-79-020 *"Method for Chemical Analysis of Water and Wastes"*. The SOPs must be detailed and specify analytes and matrices of interest for this RCRA investigation. Pertinent sections of the equivalent SW-846 method may be referenced in the SOP, but need not be included if these sections are followed without modification. If any referenced sections offer several options, the option selected must be clearly stated. To the extent possible, all SOPs should follow a definite format as described in the attached EPA Region 5 document *"Guidelines For the Preparation of Standard Operating Procedures (SOPs) For Field And Laboratory Measurements"* which is included in the Appendix to this Model QAPP.

4) Standard Operating Procedures to be used for confirmatory analysis of detected compounds, if applicable, will be stated in this section. The basis for these SOPs will be the EPA SW-846, 600 or 500 Series Methods, as stated earlier. For example, if a compound determined by GC/EC will be confirmed using a different detector system (such as FID, NPD, MS, etc.), then the SOP will have to be included in the QAPP.

5) An explanation of how the method validation study (including detection limit study) was conducted. This should be based on the laboratory SOPs and must include the criteria for acceptance, rejection or qualification of data.

6) Summary tables of analyte groups of interest (e.g. volatiles, acid/base/neutrals, metals, nutrients, etc.), including the appropriate laboratory SOP numbers and EPA method reference shall be included in this section. For each analyte group on a matrix-specific basis, all the applicable sample preparation, cleanup and analysis SOPs will be included in a table format. In addition, list each of the project target compounds in each analyte group that will be measured and reported.

7) The quantities and types of QC samples to be taken for each analyte group, on a matrix-specific basis will be included in this section. This list will reflect the specific needs of the project. The laboratory SOP will have a QC section which addresses minimum QC requirements. However, any additional project requirements will be addressed. (NOTE: Pertinent sections of the QAPP may be referenced.)

NOTE: The SOPs and method validation studies will be sent under separate cover. The SOPs and method validation study will be submitted along with the QAPP and will be referenced as an attachment in the document but will be spatially distinct from the QAPP to facilitate laboratory audit procedures.

SECTION 7

ANALYTICAL PROCEDURES

Groundwater samples and residential well water samples collected during field sampling activities for the **[Facility]** RFI will be analyzed by the **[First Laboratory name, address and telephone number]**. Soil samples collected will be analyzed by **[Second Laboratory name, address, and telephone number]**.

7.1 Field Analytical Procedures

The standardization and QA information for field measurements of pH, Eh, specific conductivity, and temperature are described in Section 3 of this QAPP. A copy of the Field Sampling Plan has been submitted with the QAPP to expedite review and approval of these methods. The SOP for the GC field screening procedure to be used during this investigation is presented as an SOP.

7.2 Laboratory Analytical Procedures

The laboratories named above will implement the project required Standard Operating Procedures (SOPs). These laboratory SOPs for sample preparation, cleanup and analysis are based on SW-846 Revision **[Revision Number and Date]** and **[other EPA methods, such as 600 Series or 500 Series Methods]**. These SOPs provide sufficient details and are specific to this RCRA facility investigation.

The site samples for volatile organic compounds analysis (VOA) shall be screened in the laboratory, as described in the VOA SOP and shall be analyzed, either as low or medium level concentration samples, or as a series of dilutions in order to cover the expected concentration range of the site-specific compounds of interest.

The site soil sample extracts requiring pesticide/PCB and/or semivolatile organic compounds analysis (acid/base/neutral analysis or ABNs) shall be subjected to gel permeation chromatography cleanup and/or other column chromatography cleanup, as necessary.

For confirmatory analysis of **[compounds of interest]**, SOP number **[Laboratory SOP number]** based on **[SW-846 method number]** will be performed.

The documentation of appropriate method validation for the project target compounds is submitted in [the Appendix to this Model QAPjP]. It includes the criteria for acceptance, rejection or qualification of data.

Tables 7.1 and 7.2 summarize the analyte groups of interest, appropriate laboratory SOP numbers and EPA reference method for the organic and inorganic analytes, respectively, to be evaluated in this investigation. The [Laboratory] SOPs to be used in this investigation have been (submitted as a separate document). **[NOTE: This table is only an example. The actual table will reflect the analytical requirements of the project.]**

7.2.1 List of project target compounds and laboratory detection limits

A complete listing of project target compounds, project quantitation limits, and current laboratory determined detection limits for each analyte group listed in Table 7.1 can be found in Section __ of this QAPP. Method detection limits shown have been experimentally determined using the method found in FR vol. 49, no. 209, page 198-199.**[NOTE: These detection limits and method of determination are essential and must be presented in the QAPP.]**

7.2.2 List of associated QC samples

The laboratory SOPs include a QC section which addresses the minimum QC requirements for the analysis of specific analyte groups. Since **[analyte 1, analyte 2, etc.]** have been found in a **[previous investigation type]** at **[concentrations]**, these compounds will be added to the spiking solution, in compliance with project requirements. Section __ of this QAPP contains a complete listing of the associated QC samples for every analyte group and matrix.

[NOTE: The following tables are examples only. The SOPs are examples of a naming convention which includes the basis for the SOP.]

TABLE 7.1

SUMMARY OF ORGANIC ANALYTICAL PROCEDURES

Analyte Group*	Lab. SOP No.	Equivalent EPA Method Number[a]
Matrix: Water		
Volatile Organics	SOP.01B8240/86 (Analysis)	8240
Semivolatiles	SOP.02B3510/86 (Sample Prep)	3510
	SOP.03B3640/86 (Cleanup/GPC)	3640
	SOP.04B8270/86 (Analysis)	8270
Matrix: Soil		
Pesticides/PCBs	SOP.05B3540/86 (Sample Prep/Soxhlet)	3540
	SOP.06B3640/86 (Cleanup/GPC)	3640
	SOP.07B3620/86 (Cleanup/Florisil)	3620
	SOP.08B3660/86 (Cleanup/Sulfur**)	3660
	SOP.09B8080/86 (Analysis***)	8080

[NOTE: The following are example notes on the options selected, where several options exist in the SOP.]

* See 7.2.1 for compounds in each analyte group.
** Sulfur cleanup will be done using mercury.
*** Pesticide/PCB analysis using dual, dissimilar megabore columns.
[a]SW-846, Third Edition

TABLE 7.2

SUMMARY OF INORGANIC ANALYTICAL PROCEDURES

Analyte*	Lab. SOP No.	Equivalent EPA Method Number[b]
Matrix: Water		
Arsenic	SOP.01B3020/86 (Digestion) SOP.01B7060/86 (Analysis)	3020 7060
Antimony	SOP.02B3005/86 (Digestion) SOP.03B7041/86 (Analysis)	3005 7041
Lead	SOP.04B3010/86 (Digestion) SOP.05B6010/88 (Analysis)	3010 6010
Sulfide	SOP.06B9030/88 (Analysis)	9030
Matrix: Soil		
Arsenic	SOP.01B3050/86 (Digestion) SOP.01B7060/86 (Analysis)	3050 7060
Antimony	SOP.02B3050/86 (Digestion) SOP.03B7041/86 (Analysis)	3050 7041
Lead	SOP.04B3050/86 (Digestion) SOP.05B6010/88 (Analysis)	3050 6010
Sulfide	SOP.06B9030/88 (Analysis)	9030[a]

[NOTE: The following are example notes on the options selected, where several options exist in the SOP.]

* See 7.2.1 for compounds in each analyte group.

[a]Modified to add soil digestion procedure; See SOP in separate attachment (Attachment _)

[b]SW-846, Third Edition

QAPP ELEMENT 10

INTERNAL QUALITY CONTROL CHECKS

This section describes all specific quality control checks to be addressed for both field and laboratory analysis in order to comply with the requirements of the project investigation. It will include, but not be limited to, the following information:

Field Quality Control Checks

- Replicate measurements per sample (if applicable)
- Duplicate samples
- Reference standards (used in calibrating field instruments such as pH meters, specific conductance or conductivity meters, potentiometer for Eh measurements, HNU GC for organics, etc.)
- For temperature measurements, thermometer is compared with NIST traceable thermometer
- Reference standards for turbidity measurements (Nephelometric method, etc.)
- Munsell color chart for color checks

Laboratory Quality Control Checks

- Field/Trip blanks
- Method blanks
- Reagent/preparation blanks (applicable to inorganic analysis)
- Instrument blanks
- Matrix spikes/matrix spike duplicates
- Surrogate spikes
- Analytical spikes (Graphite furnace)
- Field duplicates
- Laboratory duplicates
- Laboratory control standards
- Internal standard areas for GC/MS analysis; control limits
- Mass tuning for GC/MS analysis
- Endrin/DDT degradation checks for GC/EC analysis
- Second, dissimilar column confirmation for GC/EC analysis

The required laboratory SOPs [NOTE: Refer to Section 7 instructions page] will include a QC section which describes the specific QC requirements for the method.

SECTION 8

INTERNAL QUALITY CONTROL CHECKS

8.1 Field Quality Control Checks

QC procedures for pH, Eh, specific conductance, temperature and turbidity measurements of water samples will include calibrating the instruments as described in Section 6.0 of the QAPP, measuring duplicate samples and checking the reproducibility of the measurements by taking multiple readings on a single sample or reference standard. The QC information for field equipment is stated in section 3.0 of this QAPP. The thermometer used will be compared to a NIST traceable thermometer (or equivalent). Soil color checks, if required, will be done using Munsell color charts. Assessment of field sampling precision and bias will be made by collecting field duplicates and field blanks for laboratory analysis. Collection of the samples will be in accordance with the applicable procedures in section **[Section Number]** of the Field Sampling Plan (FSP) at the frequency indicated in [the Appendix to this Model QAPP].

8.2 Laboratory Quality Control Checks

The laboratory identified in Section 7 of this QAPP has a QC program it uses to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as SOPs and each SOP includes a QC section which addresses the minimum QC requirements for the procedure. The internal quality control checks might differ slightly for **each** individual procedure but in general the QC requirements include the following:

- Field/Trip blanks
- Method blanks
- Reagent/preparation blanks (applicable to inorganic analysis)
- Instrument blanks
- Matrix spikes/matrix spike duplicates
- Surrogate spikes
- Analytical spikes (Graphite furnace)
- Field duplicates
- Laboratory duplicates
- Laboratory control standards

- Internal standard areas for GC/MS analysis; control limits
- Mass tuning for GC/MS analysis
- Endrin/DDT degradation checks for GC/EC analysis
- Second, dissimilar column confirmation for GC/EC analysis

For a description of the specific QC requirements of this facility investigation and the frequency of audit, refer to the submitted SOPs. The QC criteria are also included in the SOPs.

All data obtained will be properly recorded. The data package will include a full deliverable package capable of allowing the recipient to reconstruct QC information and compare it to QC criteria. Any samples analyzed in nonconformance with the QC criteria will be reanalyzed by the laboratory, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis when necessary.

QAPP ELEMENT 11

DATA REDUCTION, VALIDATION, AND REPORTING

The project plans for reducing data, validating data, and reporting data, for both field and laboratory activities will be explained in this section of the QAPP. Data reduction is the process of converting raw analytical data to final results in proper reporting units. In most cases, data reduction will be primarily concerned with the equation used to calibrate results. Data validation is the process of qualifying analytical/measurement data on the performance of the field and laboratory quality control measures incorporated into the sampling and analysis procedures. Data reporting is the detailed description of the data deliverables used to completely document the analysis, calibration, quality control measures and calculations. Individuals responsible for implementing data reduction, validation, and reporting for the project will be identified in this section of the QAPP.

For **field activities**, data reduction, validation, and reporting must be tailored to the nature of the instrumentation being utilized. For direct reading instruments, (e.g. pH meters, thermometers), where no calculations are involved, there will ordinarily be no data reduction. Therefore, the QAPP may simply state that there is no calculation involved. In order to address data validation for direct reading instruments, it must be ensured that transcription errors have not occurred as data are copied from log books to results forms. Also, there should be review of field logs to ensure that calibration was done as defined in the SOP. Field data are usually reported through report summary sheets tabulating results and field logbooks which document calibrations.

However, for field analytical instruments where data reduction may be necessary, such as in the case of a field gas chromatograph, the level of information concerning data reduction, validation, and reporting must be comparable to that required for laboratory instrumentation, as discussed below.

For **laboratory activities**, the following items must be addressed in this section:

A. DATA REDUCTION

1. Analytical procedures will contain the equation(s) used to calculate results. It may be acceptable to reference applicable section(s) of analytical SOPs where equations may be found.

2. Reduction procedures (as well as analytical procedures) must include the equations applicable for each matrix to be analyzed.

B. DATA VALIDATION

1. Sampling and analysis procedures must be complete to prepare and review a validation procedure.

2. Validation procedure must specify the verification process of every quality control measure used in the field and laboratory.

3. A 100% laboratory data validation must be performed by an entity independent of the laboratory, (i.e., engineering firm or laboratory's corporate QA officer).

4. A validation procedure should be prepared for each analytical procedure.

5. The U.S. EPA Functional Guidelines are only directly applicable to Contract Laboratory

Program Statements of Work. CLP-SOWs. low/medium analyses. For SW846 and other analytical methods. this guidance document can be used to construct the validation procedures for these methods.

6. All qualifiers used in the validation report as well as the contents of the validation report must be defined.

7. As outlined below, a "CLP-like" data deliverables package documenting analyses is necessary for a complete validation.

C. DATA REPORTING

1. Data deliverables should completely document the analysis (i.e. recreate the analysis on paper).

2. Data deliverables should be based upon the method.

3. The QAPP should provide a listing of data deliverables and examples of forms that will be used to tabulate the information. An example of a data deliverables package is found in the CLP-SOWs. exhibits B and C.

4. CLP-SOW deliverables are only directly applicable to CLP-SOW analyses. All other analyses require listing/examples.

5. Data deliverables are necessary for complete data validation.

6. Hardcopy data deliverables should be generated at the time of analysis and not "available upon request". At a minimum, one complete "CLP-like" data package (for all samples) must be delivered to the facility, to be made available to the U.S. EPA immediately upon request.

7. Typical data deliverables typically include, (but are not necessarily limited to):

   i. case narrative
   ii. calibration (initial/continuing) summary and raw data
   iii. mass spectrometer tuning data
   iv. gas chromatograms
   v. mass spectra
   vi. quality control summary forms and raw data
   vii. ICP, AA and graphite furnace data outputs
   viii. interelement correction data
   ix. blank data results
   x. method and instrumental detection limit results

An example of a section addressing this QAPP element is presented in the following example.

SECTION 9

DATA REDUCTION, VALIDATION, AND REPORTING

All data generated through in field activities, or by the laboratory operation shall be reduced, and validated prior to reporting. No data shall be disseminated by the laboratory until it has been subjected to these procedures which are summarized in subsections below:

9.1 Data Reduction

9.1.1 Field data reduction procedures

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. Only direct read instrumentation will be employed in the field. The use of pH meters, thermometers, an OVA, and a probe to measure specific conductance will generate some measurements directly read from the meters following calibration per manufacturer's recommendations as outlined in section 6 of this QAPP. Such data will be written into field log books immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original (erroneous) entry. Later, when the results forms required for this study are being filled out, the Field Manager, identified in Section 2 of this QAPP, will proof the forms to determine whether any transcription errors have been made by the field crew.

Because the use of field instrumentation such as a mobile gas chromatograph will not be used until a later phase of the study has been reached, there will be no further need for assuring that field data has been reduced properly through the use of formulas or interpretation of raw data printouts. Later, when the Corrective Measures Implementation phase has begun, this QAPP will be modified to incorporate the use of the field gas chromatograph and any associated field data reduction procedures which may be relevant.

9.1.2 Laboratory data reduction procedures

Laboratory data reduction procedures will be followed according to the following protocol. All raw analytical data will be recorded in numerically identified laboratory

notebooks. These notebooks will be issued only by the Laboratory QA Manager. Data are recorded in this notebook along with other pertinent information, such as the sample identification number and the sample tag number. Other details will also be recorded in the lab notebook, such as the analytical method used (SOP#), name of analyst, the date of analysis, matrix sampled, reagent concentrations, instrument settings, and the raw data. Each page of the notebook shall be signed and dated by the analyst. Copies of any strip chart printouts (such as gas chromatograms) will be maintained on file. Periodic review of these notebooks by the Lab QA Manager takes place prior to final data reporting. (Records of notebook entry inspections are maintained by the Lab QA Manager.)

For this project, the equations that will be employed in reducing data are those associated with the CLP-SOW (Multi-Media, Multi-Concentration Contractural Requirements and Equations For Volatile Data Review OLM01.1, December, 1990, Appendix A). (Two of these equations, expressing analytical accuracy and precision, have been presented in section 12 of this QAPP.) Such formulae make pertinent allowances for matrix type. All calculations are checked by the Organic Section supervisor at the conclusion of each operating day. Errors are noted, corrections are made, but the original notations are crossed out legibly. Analytical results for soil samples shall be calculated and reported on a dry weight basis, and TCLP results will not be matrix spike recovery-corrected.

Quality control data (e.g. laboratory duplicates, surrogates, matrix spikes, and matrix spike duplicates) will be compared to the method acceptance criteria. Data considered to be acceptable will be entered into the laboratory computer system. Data summaries will be sent to the Laboratory QA Manager for review. If approved, data are logged into the project database format. Unacceptable data shall be appropriately quaified in the project report. Case narratives will be prepared which will include information concerning data that fell outside acceptance limits, and any other anomalous conditions encountered during sample analysis. After the Lab QA Manager approves these data, they are considered ready for third party data validation.

9.2 Data Validation

Data validation procedures shall be performed for both field and laboratory operations as described below:

9.2.1 Procedures Used to Evaluate Field Data

Procedures to evaluate field data for this project primarily include checking for transcription errors and review of field log books, on the part of field crew members. This task will be the responsibility of the Field Manager, who will otherwise not participate in making any of the field measurements, or in adding notes, data or other information to the log book.

9.2.2 Procedures to Validate Laboratory Data

Procedures to validate laboratory data will be derived exclusively from the U.S. EPA's Contract Laboratory Program, National Functional Guidelines For Organic Data Review, Multi-Media, Multi-Concentration (OLMO1.O) and Low Concentration Water (OLCO1.O), December, 1990. Essentially, all technical holding times shall be reviewed, the GC/MS instrument performance check sample results shall be evaluated, results of initial & continuing calibration will be reviewed and evaluated by trained reviewers independent of the laboratory. (The role of the Data Validators is indicated in the Project Organization (Section 2) of this QAPP.) Also, results of all blanks, surrogate spikes, matrix spikes/matrix spike duplicates, laboratory control samples, internal standards, target compound identification & quantitation, tentatively identified compounds, system performance checks shall be performed for volatile organic compounds by the Data Validator. Additionally, a method detection limit study will be performed, at the request of the U.S. EPA per the provisions of Federal Register, Vol. 49, no. 209, October 26, 1984, pp.198-199, shall be conducted. The results shall also be validated. One hundred percent of the data shall be validated.

All CLP forms summarizing this information will be checked as well. The overall completeness of the data package will also be evaluated by the Data Validator. Completeness checks will be administered on all data to determine whether deliverables specified in the RFI Workplan and QAPP are present. At a minimum, deliverables will include sample chain-of-custody forms, analytical results, QC summaries, and supporting raw data from instrument printouts. The reviewer will determine whether all required items are present and request copies of missing deliverables.

[NOTE: This is a data validation example for organic analysis. A similar process will be outlined for inorganic analyses and general parameters (i.e. fluoride, chloride, sulfate, etc.)]

9.3 Data Reporting

Data reporting procedures shall be carried out for field and laboratory operations as indicated below:

9.3.1 Field Data Reporting

Field data reporting shall be conducted principally through the transmission of report sheets containing tabulated results of all measurements made in the field, and documentation of all field calibration activities.

9.3.2 Laboratory Data Reporting

The task of reporting laboratory data (to the U.S. EPA) begins after the validation activity has been concluded. The Laboratory QA Manager must perform a final review of the report summaries and case narratives to determine whether the report meets project requirements. In addition to the record of chain-of-custody, the report format shall consist of the following:

1. Case Narrative:

   i. Date of issuance
   ii. Laboratory analysis performed
   iii. Any deviations from intended analytical strategy
   iv. Laboratory batch number
   v. Numbers of samples and respective matrices
   vi. Quality control procedures utilized and also references to the acceptance criteria
   vii. Laboratory report contents
   viii. Project name and number
   ix. Condition of samples 'as-received'
   x. Discussion of whether or not sample holding times were met
   xi. Discussion of technical problems or other observations which may have created analytical difficulties
   xii. Discussion of any laboratory quality control checks which failed to meet project criteria
   xiii. Signature of the Laboratory QA Manager

2. Chemistry Data Package

i. Case narrative for each analyzed batch of samples
ii. Summary page indicating dates of analyses for samples and laboratory quality control checks
iii. Cross referencing of laboratory sample to project sample identification numbers
iv. Data qualifiers to be used should be adequately described
v. Sample preparation and analyses for samples
vi. Sample results
vii. Raw data for sample results and laboratory quality control samples
viii. Results of (dated) initial and continuing calibration checks, and GC/MS tuning results
ix. Matrix spike and matrix spike duplicate recoveries, laboratory conrol samples, method blank results, calibration check compoounds, and system performance check compound results
x. Labelled (and dated) chromatograms/spectra of sample results and laboratory quality control checks
xi. Results of tentatively identified compounds

The data package submitted will be a "CLP-like" data package consisting of all the information presented in a CLP data package (but without the CLP forms).

QAPP ELEMENT 12

PERFORMANCE AND SYSTEMS AUDITS

The purpose of performance and system audits is to verify that the quality assurance/quality control programs are strictly followed by the appropriate personnel during the field activities (e.g. sample collection, preservation, and transportation) and laboratory activities (e.g. sample preparation, instrument calibration, sample analysis, data validation, and final evidence documentation).

The internal audits will be performed by the organization primarily responsible for performing the task. The external audits will be performed by U.S. EPA.

The performance audit is an independent check to evaluate the quality of data being generated. The system audit is an on-site review and evaluation of the facilities, instrumentation, quality control practices, data validation, and documentation practices.

This element will address the following information:

1) Field Performance and System Audits:

a) Internal and external performance and system audits to be performed will be addressed.

b) Staff responsible for performing these audits will be stated.

c) The frequency of the audit will be stated.

d) The audit procedures (including a checklist) and the documentation of audit procedures will be stated.

2) Laboratory Performance and System Audits:

a) Internal and external performance and system audits to be performed will be addressed.

b) Staff responsible for performing these audits will be stated.

c) The frequency of the audit will be stated.

d) The audit procedures (including a checklist) and the documentation of audit procedures will be stated.

SECTION 10

PERFORMANCE AND SYSTEM AUDITS

10.0 Performance and System Audits and Frequency

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the FSP and QAPP. The audits of field and laboratory activities include two independent parts: internal and external audits.

10.1 Field Performance and System Audits

10.1.1 Internal Field Audits

10.1.1.1 Internal Field Audit Responsibilities

Internal audits of field activities including sampling and field measurements will be conducted by the [Contractor] QA Officer.

10.1.1.2 Internal Field Audit Frequency

These audits will verify that all established procedures are being followed. Internal field audits will be conducted at least once at the beginning of the site sample collection activities. **[If the project duration is long (e.g. greater than one year), a periodic frequency should be stated (e.g. semi-annually)].**

10.1.1.3 Internal Field Audit Procedures

The audits will include examination of field sampling records, field instrument operating records, sample collection, handling and packaging in compliance with the established procedures, maintenance of QA procedures, chain-of-custody, etc. Followup audits will be conducted to correct deficiencies, and to verify that QA procedures are maintained throughout the remediation. The audits will involve review of field measurement records, instrumentation calibration records, and sample documentation. The field audit checklist to be used for this project is submitted with this QAPP.

10.1.2 External Field Audits

10.1.2.1 External Field Audit Responsibilities

External field audits may be conducted by the U.S. EPA [Permit Writer/Project Coordinator].

10.1.2.2 External Field Audit Frequency

External field audits may be conducted any time during the field operations. These audits may or may not be announced and are at the discretion of the U.S. EPA

10.1.2.3 Overview of the External Field Audit Process

External field audits will be conducted according to the field activity information presented in the QAPP.

10.2 Laboratory Performance and Systems Audits

10.2.1 Internal Laboratory Audits

10.2.1.1 Internal Lab Audit Responsibilities

The internal laboratory audit will be conducted by the [Contractor] QA Officer.

10.2.1.2 Internal Lab Audit Frequency

The internal lab system audits will be done on an annual basis while the internal lab performance audits will be conducted on a quarterly basis.

10.2.1.3 Internal Lab Audit Procedures

The internal lab system audits will include an examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedures, sample preparation and analysis, instrument operating records, etc. The performance audits will involve preparing blind QC samples and submitting them along with project samples to the laboratory for analysis throughout the project. The [Contractor] QA Officer will evaluate the analytical results of these blind performance samples to ensure the laboratory maintains acceptable QC performance. The laboratory audit checklist has been submitted.

10.2.2 External Laboratory Audits

10.2.2.1 External Lab Audit Responsibilities

An external audit will be conducted by U.S. EPA Region 5 Central Regional Laboratory (CRL).

10.2.2.2 External Lab Audit Frequency

An external lab audit will be conducted at least once prior to the initiation of the sampling and analysis activities. These audits may or may not be announced and are at the discretion of the U.S. EPA.

10.2.2.3 Overview of the External Lab Audit Process

[redacted] lab audits will include (but not be limited to) review of laboratory [illegible] procedures, laboratory on-site audits, and/or submission of performance [illegible] samples to the laboratory for analysis.

QAPP ELEMENT 13

PREVENTATIVE MAINTENANCE

The following types of preventative maintenance will be described in this section:

1) **Field Instrument Preventative Maintenance**

Maintenance procedures for equipment such as thermometers, pH and conductivity meters will be addressed. The use of HNu detectors and organic vapor analyzer systems will be addressed in this Section of the QAPP unless used for health and safety purposes. It will be indicated how frequently such instruments are checked (possibly as part of daily calibration), and where and how frequently such checks will be documented. Lists of critical spare parts such as tape, pH probes and batteries should be presented in the QAPP, in tabular format (this table can be included in an appendix). Any other means for ensuring that equipment to be used in the field is routinely serviced, maintained or repaired will be stated.

2) **Laboratory Instrument Preventative Maintenance**

These procedures are designed to minimize the occurrence of instrument failure and other system malfunctions and will also be included in this section of the QAPP. The laboratory's (ies') schedule for maintenance of each instrument to be used during implementation of the project will be presented in tabular format. A list of critical spare parts necessary for maintaining this equipment will also be presented in tabular format. Although it is understood that laboratory instruments are usually maintained in accordance with manufacturer's specifications, it is not acceptable to submit copies of instrument manuals to satisfy the intent of this element. If preventative maintenance is performed through a vendor contract, this information will be stated.

SECTION 11

PREVENTATIVE MAINTENANCE

11.1. Field Instrument Preventative Maintenance

The field equipment for this project includes thermometers, pH meter, and conductivity meter. Specific preventative maintenance procedures to be followed for field equipment are those recommended by the manufacturer. Field instruments will be checked and calibrated daily before use. Calibration checks will be documented on the Field Meter/calibration log sheets. are indicated in a submitted Table. The maintenance schedule and trouble-shooting procedures for field instruments are indicated in a submitted table . Critical spare parts such as tape, pH probes, and batteries will be kept on-site to reduce downtime. Backup instruments and equipment will be available on-site or within 1 day shipment to avoid delays in the field schedule.

11.2. Laboratory Instrument Preventative Maintenance

As part of their QA/QC program, a routine preventative maintenance program is conducted by [laboratory name] to minimize the occurrence of instrument failure and other system malfunctions. Designated laboratory employees shall regularly perform routine scheduled maintenance and repair of [or to coordinate with the vendor for the repair of] all instruments. All maintenance that is performed shall be documented in the laboratory's operating record. All laboratory instruments are maintained in accordance with manufacturer's specification

A Table [in the Appendix to this Model QAPP] provides the frequency which components of key analytical instruments or equipment will be serviced.

QAPP ELEMENT 14

SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

In order to address this element of the QAPP, the procedures and equations to be used to aid in assessing the accuracy and precision of analytical data, and completeness of data collection shall be clearly documented. The equations to be used for calculation of percent recovery (%R), relative percent difference (RPD) and percent valid data will be indicated.

Precision of laboratory analysis will be assessed by comparing the analytical results between matrix spike/matrix spike duplicate for organic analysis, and laboratory duplicate analyses for inorganic analysis. The relative percent difference will be calculated for each pair of duplicate analyses as indicated below.

$$RPD = \frac{S - D}{(S + D)/2} \times 100$$

Where: S = First sample value (original or matrix spike value);

D = Second sample value (duplicate or matrix spike duplicate value)

Accuracy of laboratory results will be assessed for compliance with the established quality control criteria that are cited in Section 3 of the QAPP using the analytical results of method blanks, reagent/preparation blank, matrix spike/matrix spike duplicate samples, field blank, and bottle blanks. The percent recovery of matrix spike samples will be calculated as indicated below.

$$\%R = \frac{A - B}{C} \times 100$$

Where:

A = The analyte concentration determined experimentally from the spiked sample;

B = The background level determined by a separate analysis of the unspiked sample;

C = The amount of the spike added.

Data Completeness will be assessed for compliance with the amount of data required for decision making. The completeness is calculated as indicated below:

$$\text{Completeness} = \frac{\text{(number of valid measurements)}}{\text{(number of measurements planned)}} \times 100$$

Where **"Valid Data"** refers to numbers of investigational samples obtained or to be obtained for a specific purpose, or in order to satisfy a particular project objective.

Data completeness, precision, and accuracy must be addressed in the QAPP, with respect to both field and laboratory samples. In the sample section addressing this element, a means of acceptably providing this information to the U.S. EPA is presented.

SECTION 12

SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

12.1 Accuracy Assessment

In order to assure the accuracy of the analytical procedures, an environmental sample is randomly selected from each sample shipment received at the laboratory, and spiked with a known amount of the analyte or analytes to be evaluated. In general, a sample spike should be included in every set of 20 samples tested on each instrument. The spike sample is then analyzed. The increase in concentration of the analyte observed in the spiked sample, due to the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the unspiked sample determines the percent recovery. Daily control charts are plotted for each commonly analyzed compound and kept on instrument-specific, matrix - specific, and analyte - specific bases. The percent recovery for a spiked sample is calculated according to the following formula:

$$\%R = \frac{\text{Amount in Spiked Sample} - \text{Amount in Sample}}{\text{Known Amount Added}} \times 100$$

12.2 Precision Assessment

Spiked samples are prepared by choosing a sample at random from each sample shipment received at the laboratory, dividing the sample into equal aliquots, and then spiking each of the aliquots with a known amount of analyte. The duplicate samples are then included in the analytical sample set. The splitting of the sample allows the analyst to determine the precision of the preparation and analytical techniques associated with the duplicate sample. The relative percent difference (RPD) between the spike and duplicate spike are calculated and plotted. The RPD is calculated according to the following formula:

$$RPD = \frac{\text{Amount in Spike 1} - \text{Amount in Spike 2}}{0.5(\text{Amount in Spike 1} + \text{Amount in Spike 2})} \times 100$$

12.3 Completeness Assessment

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed with a specific matrix and/or analysis. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{Completeness} = \frac{\text{(number of valid measurements)}}{\text{(number of measurements planned)}} \times 100$$

QAPP ELEMENT 15

CORRECTIVE ACTION

Information included in this QAPP element will address the entire project, not just the laboratory operation. More specifically, corrective action will focus on three general areas. These areas are 1) Field Corrective Action; 2) Laboratory Corrective Action; and 3) Corrective Action during Data Validation and Data Assessment. For each of the three areas, certain procedures and mechanisms must be stated. These include:

1. The mechanism of triggering the initiation of corrective actions;

2. The proper procedures to be used for initiating, developing, approving, and implementing the corrective actions;

3. Identification of the project personnel responsible for initiating, developing, approving, and implementing the corrective actions;

4. Alternate corrective actions to be taken; and

5. The documentation process for this corrective action will be stated

Corrective actions may be required for two classes of problems: 1) analytical and field equipment problems and 2) noncompliance problems. Analytical and equipment problems may occur during sampling and sample handling, sample preparation, laboratory instrumental analysis, and data review.

An example of how the corrective action element for a particular project may be conveyed to the U.S. EPA in a QAPP follows. Any information inside square brackets ([]) denotes replacing this information with facility and/or contractor-specific names or information.

SECTION 13

CORRECTIVE ACTION

13.0 Corrective Action

Corrective action is the process of identifying, recommending, approving and implementing measures to counter unacceptable procedures or out of quality control performance which can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation and data assessment. All corrective action proposed and implemented should be documented in the regular quality assurance reports to management. Corrective action should only be implemented after approval by the [Facility] project manager, or his designee, the [Facility] field operations manager. If immediate corrective action is required, approvals secured by telephone from the [Facility] project manager should be documented in an additional memorandum.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the [Facility] project manager, who in turn will notify the U.S. EPA RCRA Permit Writer/Project Coordinator. If the problem is analytical in nature, information on these problems will be promptly communicated to the U.S. EPA, Quality Assurance Section. Implementation of corrective action will be confirmed in writing through the same channels.

Any nonconformance with the established quality control procedures in the QAPP or Field Sampl[redacted] will be identified and corrected in accordance with the QAPP. The [Faci[redacted]ct manager, or his designee, will issue a nonconformance report for each none[redacted]ce condition. [If the activity is being performed in accordance with a legal agreement, this, as well as any other sections of the QAPP, must comply with the legal agreement.]

13.1 Field Corrective Action

Corrective action in the field can be needed when the sample network is changed (i.e. more/less samples, sampling locations other than those specified in the QAPP, etc.), sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. In general, the field team (technician, [Facility] field operations

manager, [Facility] project manager, and [Facility's] quality assurance officer) may identify the need for corrective action. The field staff in consultation with the field operation manager will recommend a corrective action. The [Facility] field operations manager will approve the corrective measure which will be implemented by the field team. It will be the responsibility of the [Facility] field operations manager to ensure the corrective action has been implemented.

If the corrective action will supplement the existing sampling plan (i.e. additional soil borings) using existing and approved procedures in the QAPP, corrective action approved by the [Facility] field operations manager will be documented. If corrective actions resulting in less samples (or analytical fractions), alternate locations, etc. which may cause project quality assurance objectives not to be achieved, it will be necessary that all levels of project management including the [Facility] project manager, and the U.S. EPA RCRA Permit Writer/Project Coordinator concur with the proposed action.

Corrective action resulting from internal field audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. The [facility] quality assurance officer will identify deficiencies and recommended corrective action to the [Facility] project manager. Implementation of corrective actions will be performed by the [Facility] field operations manager and field team. Corrective action will be documented in quality assurance reports to the entire project management.

Corrective actions will be implemented and documented in the field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be stopped by the U.S. EPA RCRA Permit Writer/Project Coordinator.

13.2 Laboratory Corrective Action

Corrective actions in the laboratory may occur prior to, during and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low/high pH readings, potentially high concentration samples may be identified during sample log-in or just prior to analysis. Following consultation with lab analysts and section leaders, it may be necessary for the laboratory Quality Control Coordinator to approve the implementation of corrective action. The submitted standard operating procedures (SOPs) specify some conditions during or after analysis that may automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, additional sample

extract cleanup, automatic reinjection/reanalysis when certain quality control criteria are not met, etc. A summary of method-specific corrective actions are found in this QAPP.

The bench chemist will identify the need for corrective action. The [Laboratory] manager, in consultation with the [Laboratory] supervisor and staff, will approve the required corrective action to be implemented by the laboratory staff. The [Laboratory] QA manager will ensure implementation and documentation of the corrective action. If the nonconformance causes project objectives not to be achieved, it will be necessary to inform all levels of project management including the U.S. EPA RCRA Permit Writer/Project Coordinator to concur with the corrective action.

These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both the [laboratory]'s corrective action log (signed by analyst, section leader and quality control coordinator), and the narrative data report sent from the laboratory to the [contractor] data validator. If corrective action does not rectify the situation, the laboratory will contact the [Facility] project manager.

Section 13.3 Corrective Action During Data Validation and Data Assessment

The facility may identify the need for corrective action during either the data validation or data assessment. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory.

These actions are dependent upon the ability to mobilize the field team, whether the data to be co[illegible]ecessary to meet the required quality assurance objectives (e.g. the holding time[illegible] is not exceeded, etc.) When the [Contractor] data assessor identifies a corrective action situation, it is the [Facility] project manager who will be responsible for approving the implementation of corrective action, including resampling, during data assessment. All corrective actions of this type will be documented by the [Facility] QA manager.

QAPP ELEMENT 16

QUALITY ASSURANCE REPORTS TO MANAGEMENT

Quality assurance reports must be submitted on a periodic basis to management during the course of the project. This is done to ensure that problems arising during the sampling and analysis phases of the project are investigated and corrected. This report will be submitted monthly (at a minimum) and can be part of the monthly progress report. This report at a minimum, will contain:

1. Data validation and assessment results since the last report; and

2. Field and laboratory audit results performed since the last report; and

3. Significant QA/QC problems, recommended solutions, and results of corrective actions.

The contents and nature of all QA reports that will be generated should be indicated in this section of the QAPP. For instance, The type of report, be it written or oral, interim versus final, should be specified in the QAPP. Furthermore, the contents of the QA reports should be specified. Some examples of relevant topics which may appear in QA reports are given below:

1. Minor changes in QAPP (NOTE: Major changes to procedures or responsibilities requires approval from the Region 5 QA Manager.);

2. Summary of QA/QC programs, training and other miscellaneous accomplishments;

3. Results of technical systems and performance evaluation audits;

4. Data quality assessment in terms of precision, accuracy, representativeness, completeness, comparability, and method detection limit;

5. Indication of whether the QA objectives were met; and

6. Limitations on use of the measurement data.

SECTION 14

QUALITY ASSURANCE REPORTS TO MANAGEMENT

The deliverables associated with the tasks identified in the RFI Workplan and monthly progress reports will contain separate QA sections in which data quality information collected during the task is summarized. Those reports will be the responsibility of the [Facility] project manager and will include the [Facility] Quality Assurance Officer report on the accuracy, precision, and completeness of the data as well as the results of the performance and system audits, and any corrective action needed or taken during the project.

14.1 Contents of Project QA Reports

The QA reports will contain on a routine basis all results of field and laboratory audits, all information generated during the past month reflecting on the achievement of specific data quality objectives, and a summary of corrective action that was implemented, and its immediate results on the project. The status of the project with respect to the Project Schedule included in the QAPP will be determined. Whenever necessary, updates on training provided, changes in key personnel, anticipated problems in the field or lab for the coming month that could bear on data quality along with proposed solutions, will be reported. Detailed references to QAPP modifications will also be highlighted. All QA reports will be prepared in written, final format by the [Facility] project manager or his designee.

In the event of an emergency, or in case it is essential to implement corrective action immediately, QA reports can be made by telephone to the appropriate individuals, as identified in the Project Organization or Corrective Action sections of this QAPP. However, these events, and their resolution will be addressed thoroughly in the next issue of the monthly QA report.

14.2 Frequency of QA Reports

The QA Reports will be prepared on a monthly basis. and will be delivered to all recipients by the end of the first full week of the month. The reports will continue without interruption, until the project has been completed. The frequency of any emergency reports that must be delivered verbally cannot be estimated at the present time.

14.3 Individuals Receiving/Reviewing QA Reports

All individuals identified in the Project Organization chart will receive copies of the monthly QA report.

APPENDIX TO MODEL QAPP

The documents enclosed in this Appendix provide examples of how certain information should be presented to the U.S. EPA Region 5. This Appendix was cited in previous sections of this Model QAPP, but the nature of the examples presented herein may not exactly correspond to the text of previous example sections. The following Tables and one guideline providing instruction on how to present Standard Operating Procedures, are included in this Appendix.

TABLE 1

Target Compound List
Volatile Organics Analytical Methods Summary

Volatile Organic Compounds	Chemical Abstracts Service Registry Number	Method Reference	Description	EQL[1] Groundwater (µg/L)	EQL[1] Low Soil/Sedim (µg/kg)
Chloromethane	74-87-3	SW-846[2] METs 8240, 5030	GC/MS Purge and Trap	10	10
Dibromomethane	74-83-9	SW-846 METs 8240, 5030	GC/MS Purge and Trap	10	10
Vinyl Chloride	75-01-4	SW-846 METs 8240, 5030	GC/MS Purge and Trap	10	10
Chloroethane	75-00-3	SW-846 METs 8240, 5030	GC/MS Purge and Trap	10	10
Methylene Chloride	75-09-2	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Acetone	67-64-1	SW-846 METs 8240, 5030	GC/MS Purge and Trap	100	100
Carbon Disulfide	75-15-0	SW-846 METs 8240, 5030	GC/MS Purge and Trap	100	100
1,1-Dichloroethene	75-35-4	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
1,1-Dichloroethane	75-35-3	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
1,2-Dichloroethane	75-35-2	SW-846 METs 8240, 5030	GC/MS Purge and Trap	10	10
Chloroform	67-66-3	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5

TABLE 1

Target Compound List
Volatile Organics Analytical Methods Summary

Volatile Organic Compounds	Chemical Abstracts Service Registry Number	Method Reference	Description	EQL[1] Groundwater (µg/L)	EQL[1] Low Soil/Sedim (µg/kg)
1,2-Dichloroethane (Total)	107-06-2	SW-846 METs 8240, 5030	GC/MS Purge and Trap	10	10
Acetonitrile	75-05-8	SW-846 METs 8240, 5030	GC/MS Purge and Trap	100	100
Allyl Chloride	107-05-1	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Benzyl Chloride	100-44-7	SW-846 METs 8240, 5030	GC/MS Purge And Trap	100	100
2-Chloroethyl vinyl ether	110-75-8	SW-846 METs 8240, 5030	GC/MS Purge And Trap	10	10
2-Butanone	78-93-3	SW-846 METs 8240, 5030	GC/MS Purge and Trap	100	100
1,1,1-Trichloroethane	71-55-6	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Carbon Tetrachloride	56-23-5	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Bromodichloromethane	75-27-4	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
1,1,2,2-Tetrachloroethane	79-34-5	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
1,2-Dichloropropane	78-87-5	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5

TABLE 1

Target Compound List
Volatile Organics Analytical Methods Summary

Volatile Organic Compounds	Chemical Abstracts Service Registry Number	Method Reference	Description	EQL[1] Groundwater (µg/L)	EQL[1] Low Soil/Sedim (µg/kg)
trans-1,3-Dichloropropene	5061-02-6	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Trichloroethene	79-01-6	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Chlorodibromomethane	124-48-1	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
1,1,2-Trichloroethane	79-00-5	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Benzene	71-43-2	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
cis-1,3-Dichloropropene	10061-01-5	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Chloroprene	126-99-8	SW-846 METs 8240, 5030	GC/MS Purge And Trap	5	5
1,2-Dibromo-3-Chloropropane	96-12-8	SW-846 METs 8240, 5030	GC/MS Purge And Trap	100	100
1,2-Dibromoethane	106-93-4	SW-846 METs 8240, 5030	GC/MS Purge And Trap	5	5
1,4-Dichloro-2-butene	764-41-0	SW-846 METs 8240, 5030	GC/MS Purge And Trap	100	100
Bromoform	75-25-2	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5

TABLE 1

Target Compound List
Volatile Organics Analytical Methods Summary

Volatile Organic Compounds	Chemical Abstracts Service Registry Number	Method Reference	Description	EQL[1] Groundwater (µg/L)	EQL[1] Low Soil/Sediment (µg/kg)
2-Hexanone	591-78-6	SW-846 METs 8240, 5030	GC/MS Purge and Trap	50	50
4-Methyl-2-pentanone	108-10-1	SW-846 METs 8240, 5030	GC/MS Purge and Trap	50	50
Tetrachloroethene	127-18-4	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Toluene	108-88-3	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Chlorobenzene	108-90-7	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Ethyl Benzene	100-41-4	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Styrene	100-42-5	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Total Xylenes	1330-20-7	SW-846 METs 8240, 5030	GC/MS Purge and Trap	5	5
Dichlorodifluoromethane	75-71-8	SW-846 METs 8240, 5030	GC/MS Purge And Trap	5	5
trans-1,2-Dichloroethene	156-60-5	SW-846 METs 8240, 5030	GC/MS Purge And Trap	5	5
Ethyl methacrylate	97-63-2	SW-846 METs 8240, 5030	GC/MS Purge And Trap	5	5

TABLE 1

Target Compound List
Volatile Organics Analytical Methods Summary

Volatile Organic Compounds	Chemical Abstracts Service Registry Number	Method Reference	Description	EQL[1] Groundwater (µg/L)	EQL[1] Low Soil/Sedim (µg/kg)
Isobutyl Alcohol	78-83-1	SW-846 METs 8240, 5030	GC/MS Purge And Trap	100	100
Methyacrylonitrile	91-80-5	SW-846 METs 8240, 5030	GC/MS Purge And Trap	100	100
Methyl iodide	74-88-4	SW-846 METs 8240, 5030	GC/MS Purge And Trap	5	5
Methyl methacrylate	80-62-6	SW-846 METs 8240, 5030	GC/MS Purge And Trap	5	50
Pentachloroethane	76-01-7	SW-846 METs 8240, 5030	GC/MS Purge And Trap	10	10
Propionitrile	78-02-9	SW-846 METs 8240, 5030	GC/MS Purge And Trap	100	100
1,1,1,2-Tetrachloroethane	630-20-6	SW-846 METs 8240, 5030	GC/MS Purge And Trap	100	100
1,2,3-Trichloropropane	96-18-4	SW-846 METs 8240, 5030	GC/MS Purge And Trap	5	5
Vinyl Acetate	108-05-4	SW-846 METs 8240, 5030	GC/MS Purge And Trap	50	50
Acrolein	107-02-8	SW-846 METs 8240, 5030	GC/MS Purge And Trap	100	100
Acrylonitrile	107-13-1	SW-846 METs 8240, 5030	GC/MS Purge And Trap	100	100

TABLE 1

Target Compound List
Volatile Organics Analytical Methods Summary

Volatile Organic Compounds	Chemical Abstracts Service Registry Number	Method Reference	Description	EQL[1] Groundwater (µg/L)	EQL[1] Low Soil/Sedim (µg/kg)
Trichlorofluoromethane	75-69-4	SW-846 METs 8240, 5030	GC/MS Purge And Trap	5	5

[1]EQL: Estimated Quantitation Limit is from SW-846 (reference footnote 2 below).
[2]SW-846: EPA Test Methods for Evaluating Solid Waste-Physical/Chemical Methods, SW-846, 3rd Edition, 1990.

TABLE 2

Quality Control Performance Criteria for Matrix Spikes/Matrix Spike Duplicates and Surrogates

	Matrix Spike/Dup			
	% Recovery		% RPD	
	Water	Soil	Water	Soil
Volatile Organic Compounds				
1,1-Dichloroethene	61-145	59-173	14	22
Trichloroethene	71-120	62-137	14	23
Benzene	76-127	66-142	11	21
Toluene	76-125	59-139	13	21
Chlorobenzene	75-130	60-133	13	21

TABLE 3

Quality Control Performance Criteria for Matrix Spikes/Matrix Spike Duplicates and Surrogates

	Matrix Spike/Dup				Surrogate	
	%Recovery		%RPD		%Recovery	
	Water	Soil	Water	Soil	Water	Soil
Pesticides/PCBs						
Tetrachloro-m-xylene					60-150	60-150
Decachlorobiphenyl					60-150	60-150
γ-BHC (Lindane)	56-123	46-127	15	50		
Heptachlor	40-131	35-130	20	31		
Aldrin	40-120	34-132	22	43		
Dieldrin	52-126	31-134	18	38		
Endrin	56-121	42-139	21	45		
4,4'-DDT	38-127	23-134	27	50		

TABLE 1

Quality Control Performance Criteria for Matrix Spikes/Matrix Spike Duplicates and Surrogates

	Matrix Spike/Dup				Surrogate	
	%Recovery		%RPD		%Recovery	
	Water	Soil	Water	Soil	Water	Soil
Semivolatile Organic Compounds						
Nitrobenzene-d5					35-114	23-120
2-Fluorobiphenyl					43-116	30-115
Terphenyl-d14					33-141	18-137
Phenol-d5					10-94	24-113
2-Fluorophenol					21-100	25-121
2,4,6-Tribromophenol					10-123	19-122
Phenol	12-110	26-90	42	35		
2-Chlorophenol	27-123	25-102	40	50		
1,4-Dichlorobenzene	36-97	28-104	28	27		
N-Nitroso-di-N-propylamine	41-116	41-126	38	38		
1,2,4-Trichlorobenzene	39-98	38-107	28	23		
4-Chloro-3-Methylphenol	23-97	26-103	42	33		
Acenapthene	46-118	31-137	31	19		
4-Nitrophenol	10-80	11-114	50	50		
2,4-Dinitrotoluene	24-96	28-89	38	47		
Pentachlorophenol	9-103	17-109	50	47		
Pyrene	26-127	35-142	31	36		

TABLE 5
SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

SWMU[1]	Sample Matrix	Field Parameters	Laboratory[3] Parameters	Investigative[4] Samples		Field Quality Assurance/Quality Control Samples						Matrix Total
						Matrix Duplicates		Matrix Spike/[5] Matrix Spike Duplicates		Blanks[6]		
				No.	Total	No.	Total	No.	Total	No.	Total	
#1-DSO Landfill	Soil	Qualitative screening with photoionization detector	Metals[2] Volatiles[2] Semivolatiles[2]	88 6 6	88 6 6	9 1 1	9 1 1	4 1 1	4 1 1	0 0 0	0 0 0	101 8 8
#2-Storm water Retention Pond	Water	Qualitative screening with photoionization detector pH Specific Conductance Temperature	Metals Volatiles Semivolatiles Cyanide	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 2 1 1	4 5 4 4
	Soil/ Sediment	Qualitative screening with photoionization detector	Metals Volatiles Semivolatiles Cyanide	5 5 5 5	5 5 5 5	1 1 1 1	1 1 1 1	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	6 6 6 6
#8, 9-Waste Acid Tanks	Soil	Qualitative screening with photoionization detector Field pH	Metals pH	25 25	25 25	3 3	3 3	1 1	1 1	0 0	0 0	29 29
#13-Waste Acid Pit	Soil	Qualitative screening with photoionization detector Field pH	Metals pH	14 14	14 14	2 2	2 2	1 1	1 1	0 0	0 0	17 17

(1) Figure 1-2 shows the location of each SWMU.
(2) Samples will be composited for metals and semivolatiles. See Section 3.1.2 of Work Plan for a description of sample locations.
(3) Analytes selected include 40 CFR Part 264, Appendix IX metals, cyanide, Target compound list volatiles and semivolatiles. See Tables 4-4, 4-5, and 4-6.
(4) The frequency of sampling is one for this RFI.
(5) Additional sample volume required for matrix spike/matrix spike duplicate.

TABLE 5

SWMU[1]	Sample Matrix	Field Parameters	Laboratory[3] Parameters	Investigative[4] Samples		Field Quality Assurance/Quality Control Samples						Matrix Total
						Matrix Duplicates		Matrix Spike/[5] Matrix Spike Duplicates		Blanks[6]		
				No.	Total	No.	Total	No.	Total	No.	Total	
#21, 22-Slag Reclaim Dust Collector and Dumpster	Soil	Qualitative screening with photoionization detector	Metals	3	3	1	1	0	0	0	0	4
#25-Outfall 005	Water	Qualitative screening with photoionization detector pH *Specific Conductance* Temperature	Semivolatiles Volatiles Metals Cyanide	2 2 2 2	2 2 2 2	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 2 1 1	1 2 1 1	5 6 5 5
	Soil	Qualitative screening with photoionization detector	Semivolatiles Volatiles Metals Cyanide	3 3 3 3	3 3 3 3	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	0 0 0 0	0 0 0 0	4 4 4 4
Background Samples	Soil	Qualitative screening with photoionization detector Field pH	Metals Volatiles Semivolatiles Cyanide	20 5 5 20	20 5 5 20	2 1 1 2	2 1 1 2	1 1 1 1	1 1 1 1	0 0 0 0	0 0 0 0	23 7 7 23

(1) Figure 1-2 shows the location of each SWMU.
(2) Samples will be composited for metals and semivolatiles. See Section 3.1.2 of Work Plan for a description of sample locations.
(3) Analytes selected include 40 CFR Part 264, Appendix IX metals, cyanide, Target compound list volatiles and semivolatiles. See Tables 4-4, 4-5, and 4-6.
(4) The frequency of sampling is one for this RFI.
(5) Additional sample volume required for matrix spike/matrix spike duplicate.
(6) Blank totals include estimated trip, field blanks, and equipment blanks.

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
FAA	SW-846	4	Correlation coefficient must be ≥ 0.995	At least daily, or as required (when CCV fails acceptance criteria)	Every calibration	90-110%R	Every 10 analytical samples	90-110%R
	EPA600/4-79/080	4				90-110%R		90-110%R
	CLP	4				90-110%R		90-110%R
CVAA	SW-846	4				80-120%R		80-120%R
	EPA600/4-79/080	4				80-120%R		80-120%R
	CLP	4				80-120%R		80-120%R
ICP	SW-846	1				90-110%R		90-110%R
	EPA600/4-79/080	1				90-110%R		90-110%R
	CLP	1				90-110%R		90-110%R
GFAA	SW-846	4				85-115%R		85-115%R
	EPA600/4-79/080	4				85-115%R		85-115%R
	CLP	4				90-110%R		90-110%R
pH Meter	SW-846	3	±0.1 STD units of true value			± 0.1 STD units of true value		± 0.1 STD unit of true value
	CLP	3						

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC/MS-volatiles	SW-846 (8240,8260)	5	%RSD<30% (CCC) 1,1-dichloroethene; chloroform 1,2-dichloropropene; toluene ethyl benzene; vinyl chloride RF>0.30(SPCC) chloromethane; 1,1-dichloroethane; bromoform (0.25); 1,1,2,2-tetrachloroethene; chlorobenzene	As needed	As needed	± 20%	daily 12 hr.	CCC %D <25% same SPCC criteria as initial calibration
	40CFR136, 624	5	all cmpds %RSD <35% or use calibration curve	As needed	As needed	± 20%R	daily 24 hr.	Compare w/Table 9 "Q" (attached)
	CLP SOW 2/88	5	same as SW846	As needed	As needed, usually w/PE's	± 20%R	daily 12 hr.	same as SW-846

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC/MS-volatiles	*CLP SOW OLM01.5*	5	min RF Bromoform 0.10 Vinyl Chloride 0.10 1,1-dichloroethene 0.10 1,1-dichloroethane 0.20 Chloroform 0.20 1,2-dichloroethane 0.10 1,1,1-trichloroethane 0.10 carbon tetrachloride 0.10 bromodichloromethane 0.20 cis-1,3-dichloropropene 0.20 trichloroethene 0.30 dibromochloromethane 0.10 1,1,2-trichloroethane 0.10 benzene 0.50 trans-1,3-dichloropropene 0.10 bromoform 0.10 tetrachloroethene 0.20 1,1,2,2-tetrachloroethane 0.50 toluene 0.40 chlorobenzene 0.50 ethylbenzene 0.10 styrene 0.30 xylene (total) 0.30 bromofluorobenzene 0.20 all % RSD <20.5 Other target compounds must meet minimum RF of 0.10 No %RSD criteria	As needed	As needed, usually w/PE's	± 20%R	Daily every 12 hours	RF criteria same as initial cal. %D <25.0
	EPA 524.2	5	% RSD <20% or use cal curve - all target compounds	As needed	As needed	± 20%R	Daily, every 8 hours	All compounds RF%D <30% ISTD [illegible]s >30% [illegible]50% of initial cal.

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC/MS - semi-volatiles	SW846-8270	5	%RSD < 30% (CCC) acenaphthene 1,4-dichlorobenzene hexachlorobutadiene N-nitroso-diphenylamine di-octylphthalate fluoranthene benzo(a)pyrene 4-chloro-3-methylphenol 2,4-dichlorophenol 2-nitrophenol phenol pentachlorophenol 2,4,6-trichlorophenol RF >0.05(SPCC) N-nitrosodipropylamine hexachlorocyclopentadiene 2,4-dinitrophenol 4-nitrophenol	As needed	As needed	± 20%R	Daily, every 12 hours	CCC % D < 25% same SPCC criteria as initial cal.
	40CFR136 625	5	%RSD < 35% or cal. curve all compounds	As needed	As needed	± 20%R	Daily every 24 hours	% D < 20%
	CLP SOW 2/88	5	Same as SW846-8270	As needed	As needed w/PE's	± 20%R	Daily every 12 hours	Same as SW846-8270

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC/MS - semi-volatiles	CLP SOW OLM01.5	5	min. RF phenol 0.80 bis(2-chloroethyl)ether 0.70 2-chlorophenol 0.80 1,3-dichlorobenzene 0.60 1,4 dichlorobenzene 0.50 1,2-dichlorobenzene 0.40 2-methylphenol 0.70 4-methylphenol 0.60 N-nitrosodipropylamine 0.50 hexachloroethane 0.30 nitrobenzene 0.20 isophorone 0.40 2-nitrophenol 0.10 2,4-dimethylphenol 0.20 bis(2-chloroethoxy)methane 0.30 2,4-dichlorophenol 0.20 1,2,4-trichlorobenzene 0.20 naphthalene 0.70 4-chloro-3-methylphenol 0.20 2-methylnaphthalene 0.50 2,4,6-trichlorophenol 0.20 2,4,5 trichlorophenol 0.20 2-chloronaphthalene 0.80 acenaphthylene 1.30 2,6-dinitrotoluene 0.20 acenaphthene 0.80 dibenzofuran 0.80 2,4-dinitrotoluene 0.20 4-chlorophenylphenylether 0.40 fluorene 0.90 4-bromophenylphenylether 0.10 hexachlorobenzene 0					%D < 25 RF criteria same as initial calibration

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC/MS - semi-volatiles	CLP SOW OLMO1.5		pentachlorophenol 0.05 phenanthrene 0.70 anthracene 0.70 fluoranthene 0.60 pyrene 0.60 benz(a)anthracene 0.80 chrysene 0.70 benzo(b)fluoranthene 0.70 benzo(k)fluoranthene 0.70 benzo(a)pyrene 0.70 indeno(1,2,3,cd)pyrene 0.50 dibenz(a,h)anthracene 0.40 benzo(ghi)perylene 0.50 nitrobenzene d5 0.20 2-fluorobiphenyl 0.70 terphenyl-d_{14} 0.50 phenol-d_5 0.80 2-fluorophenol 0.60 2-chlorophenol-d_4 0.80 1,2-dichlorobenzene-d_4 0.40 %RSD < 20.5%. Other target compounds have no %RSD but must have RF > 0.01					
	EPA525	6	%RSD < 30% all compounds. Chromatographic separation of isomers	As needed	As needed	± 20%R	daily, every eight hours	RF %D < 30% ISTD areas > 30% < 150% from initial cal

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC/NPD	N-P containing pesticides EPA 507	3	RF < 20% RSD or single point (single point must be within 20% of sample concentration)	As needed when CCV > 20% diff., upon detection of analyte after running low level single point to demonstrate detectability[2]	quarterly	20%D	2 times daily, beginning and end of day	20%D
	Organophosphorus pesticides SW-846 8141	5	RF < 20% RSD or cal. curve		quarterly	15%D	Daily	15%D
	Simetryn & Terbutryn EPA 619	3	RF < 10% RSD or cal. curve	Daily	As needed and with the prep of new std.	10%D	Each working shift	10%D
	Nitrosamines EPA 607	3	RF < 10% RSD or cal. curve	Daily	As needed and with the prep of new std.	15%D	Each working day	15%D
GC/FID	8015	5	RF < 20% RSD or cal. curve	As needed, when CCV > 15%D	Quarterly	15%D	Daily	15%D
	SW-846 8100	5	RF < 20% RSD or cal. curve	With each analytical sequence	As needed, with prep of new std.	15%D	Daily	15%D
	SW-846 8030	5	RF < 20% RSD or cal. curve	As needed when CCV > 15% D	As needed with prep of new standard	15%D	Daily, 10%, ending	15%D

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
HPLC	EPA 531.1	3-5	RF < 20% RSD or single point or calibration curve	As needed, when CCV > 20%D	Quarterly	20%D	Min. of 2 1 beg, 1 end	20%D
	SW-846 8310	5	RF < 20% RSD or cal. curve	As needed, when CCV > 15%D or every 6 months	As needed, with prep of new std.	15%D	Daily, 10%	15%D
	EPA 610	3	RF < 10% RSD or cal. curve	When CCV > 15%D	As needed, with prep of new std.	15%D CCV vs. cal. curve	Daily 10%	15%D
GC-PID/ ELCD	EPA 502.2	3-5	RF < 10% RSD or cal. curve or single point cal.	When CCV > 20%D	As needed, with prep of new std. or quarterly	20%D	Daily	20%D
	EPA 601	3	RF < 10% RSD or cal. curve	As needed, when ICV or CCV > Table 2 criteria	As needed, with prep of new std.	See method 601 Table 2 criteria ~ 30%D (Q Value)	Daily Note: ICV = CCV in this case (different source than calibration stds.)	For % Rec. see method 601 Table 2 (Q Value)
	EPA 602	3	RF < 10% RSD or cal. curve	As needed, when ICV or CCV > Table 2 criteria		See method 602 Table 2 Criteria ~ 25%D (Q Value)		For % Rec. see method Table 2 (Q Value)
	SW-846 8010	5	RF < 20% RSD or cal. curve	As needed, when CCV > 15%D	As needed, with prep of new std	15%D	Daily 10%, ending	15%D
	SW-846 8020					15%D		15%D

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC-PID/ ELCD	SW-846 8021	5	RF < 20% RSD or cal. curve	As needed, when CCV > 15%D	As needed with prep of new std.	15%D	Daily 10%, ending	15%D
FTIR	EPA 418.1	5	20%D Correlation Coeff (r) ≥ 0.995	When CCV is > 20%D	As needed, with prep of new std.	20%D	Beg. and end of each sequence	20%D
	Standard Methods 503	5	20%D Correlation Coeff. (r) ≥ 0.995	When CCV is > 20%D	As needed, with prep of new std.	20%D	Beg. and end of each sequence	20%D
GC-ECD	EPA 548.1 (Endothall)	3	Linearity < 20% RSD	Each Run	As needed with each new std. quarterly at a minimum	80-110%	Every fifth injection	Primary column %D <15. Conf column %D <20. R.T. Shift, Capp. columns <0.3%. RT Shift Mega-Bore Columns <1.5%
	CLP-SOW 2/88	3	Linearity <20% RSD Generate calibration curve for all single analytes detected in samples where the % RSD ≥ 10% Retention time windows: Wide Bore capp. column: ± 0.75% Narrow Bore Capp column: ± 0.15%	Each run or every 72 hours	As needed with each new std. quarterly at a minimum	80-110%	Every fifth injection	Primary column %D <15. Conf. column %D <20. R.T. Shift, Capp. columns <0.3%. RT Shift Mega-Bore Columns <1.5% Breakdown criteria: DDT <20% Endrin [illegible]% Combi[illegible]<30%

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC-ECD	EPA 508	3	Linearity <20% RSD	Each Run	As needed. With each new std Quarterly at a minimum.	80-110%R	Every fifth injection	Primary column %D <15. Conf. column %D <20. R.T. Shift, Capp. columns <0.3%. RT Shift Mega-Bore Columns <1.5% Breakdown criteria: DDT <20% Endrin <20%
	EPA 504	5	Linearity <20% RSD	Each Run	As needed. With each new std. Quarterly at a minimum	80-110%R	Every fifth injection	Primary column %D <15. Conf. column %D <20. R.T. Shift, Capp. columns <0.3%. RT Shift Mega-Bore Columns <1.5%
	APHA 509A (Standard Methods)	3	Linearity <20% RSD	Each Run	As needed. With each new std Quarterly at a minimum	80-110%R	Every fifth injection	Primary column %D <15. Conf column %D <20 R.T. Shift, Capp. columns <0.3%. RT Shift Mega-Bore Columns <1.5% Breakdown criteria: DDT <20% Endrin <20%

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC-ECD	EPA 608	3	Linearity <20% RSD	Each Run	As needed. With each new std. Quarterly at a minimum	80-110%R	Every fifth injection	Primary column %D <15. Conf. column %D <20. R.T. Shift, Capp. columns <0.3%. RT Shift Mega-Bore Columns <1.5% Breakdown criteria: DDT <20% Endrin <20% Combined <30%
	SW-846 8080 SW-846 8150	5	Linearity <20% RSD	Each Run	As needed. With each new std. Quarterly at a minimum	80-110%R	Every fifth injection	Primary column %D <15. Conf. column %D <20. R.T. Shift, Capp. columns <0.3%. RT Shift Mega-Bore Columns <1.5% Breakdown criteria: DDT <20% Endrin <20% Combined <30%

Table 6
INSTRUMENT CALIBRATION

Instrument	Method Reference	# Standards Initial Calibration	Acceptance/ Rejection Criteria - Initial Calibration	Frequency of Calibration	Frequency of Initial Calibration Verification[1]	Acceptance/ Rejection Criteria - Initial Calibration Verification	Frequency of Continuing Calibration Verification[1]	Acceptance/ Rejection Criteria - Continuing Calibration Verification
GC-ECD	EPA 515.1	3	Linearity <20% RSD	Each Run	As needed. With each new std. Quarterly at a minimum	80-110%R	Every fifth injection and beginning and end of run.	Primary column %D <15. Conf. column %D <20. R.T. Shift, Capp. columns <0.3%. RT Shift Mega-Bore Columns <1.5%
	EPA OLM01.3	3+Instr. Blank Multi-Comp. Targets Calib. as single point	All peaks 100% resolved. Performance evaluation mixtures (PEMs) ≤ 25.0 RPD. 1 Chromatogram from each of 2 indiv. A&B must yield peak highs of 50-100% of full scale. Resolution of midpoint std. mixes A&B ≥ 90% linearity ≤ 20% RSD except: Surrogates ≤ 30% Any 2 targets ≤ 30% Resolution check mix ≥ 60% Breakdown of DDT & Endrin ≤20%, Combined < 30%	Each Run	As needed. With each new std. Quarterly at a minimum	80-110%R	Every 12 hours (PEM or indiv. A&B)	PEMs and Indiv. A&B within RT windows of init. calibration. PEMs RPD ≤ 25.0. Resolution of PEM must be 100%. Resolution of indiv. A&B ≥ 90% Breakdown of DDT & Endrin ≤ 20% Combined ≤ 30%

1 Number of Standards Run is 1, unless noted otherwise

2 Only when an unusually large analyte list requires analysis of more than one standard mix for injection by GC/NPD.

Table 6 - Attachment
GC/MS - Volatiles
Continuing Calibration Check - EPA Method 624

	Range for "Q" in ug/L
Benzene	12.8-27.2
Bromoform	14.2-25.8
Carbon tetrachloride	14.6-25.4
Chlorobenzene	13.2-26.8
Chloroethane	7.6-32.4
2-Chloroethylvinyl-ether	D-44.8
Chloroform	13.5-26.5
Dibromochloromethane	13.5-26.5
Bromodichloromethane	13.1-26.9
1,4-Dichlorobenzene	12.6-27.4
1,1-Dichloroethane	14.5-25.5
1,2-Dichloroethane	13.6-26.4
1,1-Dichloroethene	10.1-29.9
1,2-Dichloropropane	6.8-33.2
trans-1,3-Dichloropropene	10.0-30.0
Ethylbenzene	11.8-28.2
Bromomethane	2.8-37.2
Chloromethane	D-40.8
Methylene Chloride	12.1-27.9
1,1,2,2-Tetrachloroethane	12.1-27.9
Tetrachloroethene	14.7-25.3
Toluene	14.9-25.1
trans-1,2-Dichloroethene	13.9-26.1
1,1,1-Trichloroethane	15.0-25.0
1,1,2-Trichloroethane	14.2-25.8
Trichloroethene	13.3-26.7
Trichlorofluoromethane	9.6-30.4
Vinyl Chloride	0.8-39.2

TABLE 7

INSTRUMENT	ACTIVITY	FREQUENCY
Gas Chromatograph/ Mass Spectrometer	Change septum	Monthly/as needed
	Check carrier gas	Daily
	Change carrier gas	When pressure reaches 100 psi
	Change gas filters	Semi-annually/as needed
	Change trap on Tekmar	As needed/poor sensitivity
	Change GC column	As needed/poor sensitivity
	Clean MS source	As needed/poor sensitivity
	Check pump of leaks	Monthly
	Leak Check septum	As needed/when leak suspected
	Check gas flow	As needed
	Clean VOA purge glassware	As needed
	Cut capillary column	As needed
	Replace liner	As needed/contamination susp.
	Replace BNA seal	As needed/contamination susp.
Lachat Quikchem AE	Dry and clean random access sampler	Daily
	Clean sample boats	Daily
	Coat rollers of pump with silicone spray	Every 2500 samples
	Replace pump tubes	Monthly
	Replace flames at port of valve module	Every 25000 samples
	Clean unions of the valve	Every 25000 samples
	Replace O-rings	When necessary
	Clean each port of the valve	Weekly
	Clean fitting of manifolds	Every 25000 samples
TOC	Replace water in IC Chamber	Weekly
	Clean IC chamber	As needed
	Clean underside of IC Inlet valve	As needed
	Check combustion tube	Daily
	Repack quartz wool in comb. tube	As needed
	Check TC inlet valve	Daily
	Clean TC inlet valve	As needed
	Refill acid bottle	When 2/3 empty
GPC	Change seals and oil motor on positive displacement pump	Ever 1500-2000 hours of use
	Repack column	When column flow is restricted or operating pressure increases
	Check system pressure	Check daily when operating
	Replace mesh at column effluent/influent	Replace if torn or wrinkled
	Check calibration, pressure and solvent flow	Check weekly

PREVENTATIVE MAINTENANCE

INSTRUMENT	ACTIVITY	FREQUENCY
Atomic Absorption Furnace	Clean furnace windows	Daily
	Check plumbing connections	Daily
	Change graphite tube	As needed
	Check gases	Daily
	Check autosampler and tubing	Daily
ICAP	Clean filters	Monthly
	Check gas flow	Daily
	Change tubing	Weekly
	Clean nebulizer	As needed
	Check autosampler and tubing	Daily
Gas Chromatograph-Volatiles	Check Hall propanol flow	Daily
	Check Hall furnace temp.	Daily
	Check PID sensitivity	Daily
	Change lamp	As needed
	Rinse purge devices	Daily
	Bake purge devices	Daily
	Check carrier gases	Daily
	Change carrier gases	As needed
	Check column flows	Daily
	Check for gas leaks	At each column change
	Replenish electrolytic conductivity detector solvents	As needed
	Clean transfer lines	As needed
Gas Chromatograph-Semivolatiles	Change septum	Every 100 shots or as needed
	Check carrier gas	Daily
	Change carrier gas	When pressure reaches 250 psi
	Change in-line filters	Every 6 mos. or as needed
	Remove first foot of capillary column	As needed
	Clean ECD	As needed
	Clean Nitrogen-Phosphorous Detector	As needed
	Check system for gas leaks	At each column change
	Replace column	As needed
	Clean FID	As needed
	Replace capillary injection port liner	At column change or as needed
	Replace capillary injection port seal	As column change or as needed
	Measure gas flow	After changing column
	Check syringe	Daily
	Change syringe	As needed

EQUIPMENT MONITORING

EQUIPMENT TYPE	ACTIVITY	FREQUENCY
Ovens	Temperature monitoring	Twice daily
Refrigerators	Temperature monitoring	Twice daily
Incubators	Temperature monitoring	Twice daily
Walk-in Cooler	Temperature monitoring	Twice daily

PREVENTATIVE MAINTENANCE

TABLE 8

INSTRUMENTS	MAINTENANCE PROCEDURES/SCHEDULE	SPARE PARTS IN STOCK
Photovac MicroTIP Photoionization Detector	1. Calibrate beginning and end of each day and as necessary during use. 2. Check battery, and recharge when low. 3. Clean lamp window every 24 hours of operation. 4. Replace dust filter every 240 hours of operation. 5. Replace sample pump every 5000 hours of operation.	1. Battery charge 2. Spare lamps 3. Spare filter cartridges
Thermo Environmental Model 580B Photoionization Detector	1. Calibrate beginning and end of each day, and as necessary during use. 2. Check battery, and recharge when low. 3. Clean lamp and dust filter as needed. 4. Replace water traps if they become wet.	1. Spare lamps 2. Spare dust filters.
Field Gas Chromatograph	1. Change injector septa daily. 2. Repack column when separation and linearity becomes poor. 3. Clean PID lamp before each initial calibration; change when sensitivity lost. 4. Clean injector port/liner weekly.	1. Septa 2. Empty columns and column packing 3. PID lamps 4. Injector [illegible]es
pH Meter	1. Calibrate beginning and end of each day, and as necessary during use. 2. Replace electrodes as needed.	1. pH buffers 2. Batteries 3. Spare electrodes
Conductivity Meter	1. Calibrate beginning and end of each day, and as necessary during use. 2. Check redline and replace batteries if does not calibrate.	1. Batteries
HNu Model Photoionization Detector	1. Calibrate beginning and end of each day, and as necessary during use. 2. Check battery, and recharge when low. 3. Clean UV lamp, ion chamber, and fan if calibration falls outside 10% of the calibration standard, or if readings are erratic.	1. Battery charge 2. Spare lamps

GUIDELINE FOR THE PREPARATION OF STANDARD OPERATING PROCEDURE

Analytical methods, including both qualitative and quantitative methods, to be used by laboratory selected for a specific project shall be submitted to Region V Quality Assurance Section (QAS) for review/approval prior to use in project activities. These analytical methods should be submitted in a format of standard operating procedure (SOP), which shall describe in detail the exact procedure and material required to analyze the samples. The following items shall be included in the standard operating procedure:

1. Scope and Application.
2. Safety precaution.
3. Sample Size Requirements, and Sample Collection (including sample handling, preservation and holding time).
4. Instrumental Detection Limits and/or Method Detection Limits, and working linear ranges for each parameter.
5. Interferences and Corrective Measurements.
6. Apparatus (including instruments, and instrumental parameters/ conditions), and materials.
7. Reagents.
8. Calibration Procedures (including the preparation of calibration standard solutions, instrument tuning and performance check, etc.).
9. Sample preparations (i.e., extraction, digestion, distillation, etc.)
10. Diagram or tables that describes/outlines the procedure.
11. Step-by-step Analytical procedure (including separate procedure for each sample matrix if the method is used for more than one sample matrix).
12. Details of calibration (including the equation used for the calculation).
13. Quality Control (QC) Requirements (i.e., analysis of method blank, reagent blank, duplicate samples, etc.)
14. Data Reporting Requirements (including data reporting units and data reporting format.)

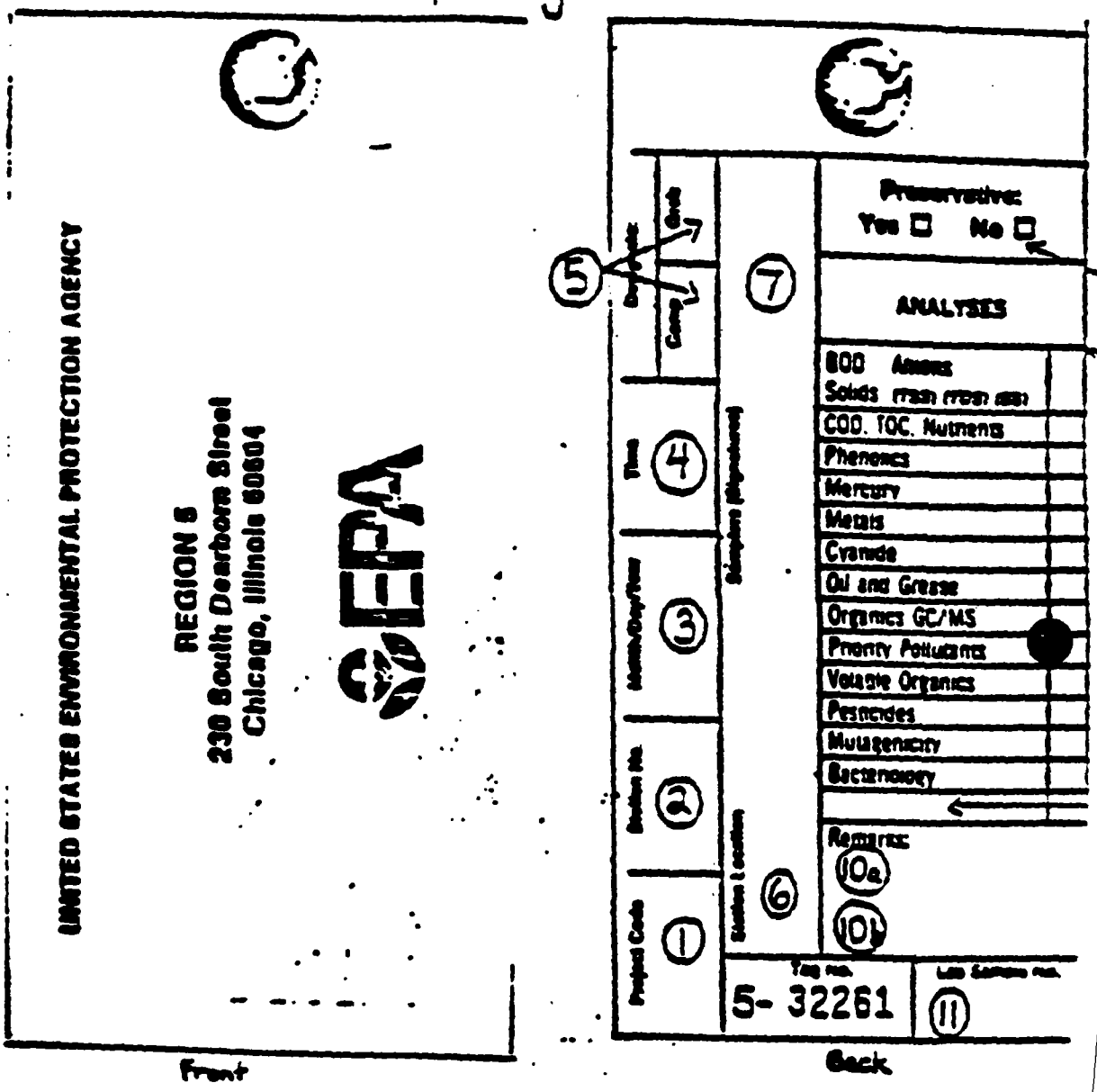
15. Preventative Maintenance

16. References

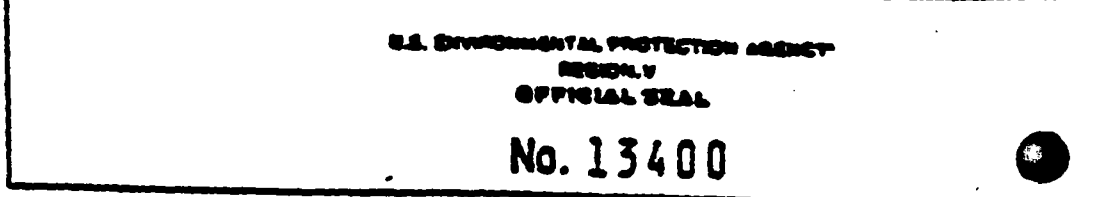
Method validation data, if available, should be attached to the SOP to support the limitation and applicability of the method. If the method validation data is not avialble, the SOP shall include the effort of method validation to be done prior to the use of this method for sample analysis.

CHAIN OF CUSTODY EXAMPLES

Sample Tag



Each cooler should have 2 COC seals applied.



Chain of Custody Seal

SAMPLE TAG

1. Enter your project number for the site, which may be the first six digits of the CRL log number (see page C-21).
2. Enter the sampling station code, i.e., MW1, BLK, SS1, etc.
3. Enter date of sampling.
4. Enter time of sampling (military time only).
5. Specify "grab" or "composite" sample with an "X".
6. Insert station location. If the sample is a field blank or if to be used for the spike or duplicate analysis, notate here.
7. Obtain signature of sample team leader.
8. Indicate presence of preservative with an "X".
9. Specify analytes for analysis with an "X".

10a. Indicate traffic report number (i.e., EW846 or MEX013) for that sample if the samples are being shipped to the CLP. If the samples are going to the CRL, list the CRL log number.

10b. Indicate the case number.

11. Leave BLANK (for laboratory use only).
12. Enter any desired analyses not listed on the tag provided (e.g., PCB's, ammonia, sulfide, etc.) and mark the box with an "X".

NOTE: Each sample container should have a separate tag.
All field blanks should be designated as such on the sample tags, either in the 'Remarks' field (10a and 10b) or in the 'Station Location' field (6).

Organic Traffic Report

(For Organic CLP Analysis)

EPA — United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703 557 2490 FTS 557-2490

SAS No. (If applicable):

Case No.: 12345

1. Project Code: | Account Code:

Regional Information:

Non-Superfund Program:

Site Name: Landfill

City, State: Chicago, IL | Site Spill ID: ZZ

2. Region No.: II | Sampling Co.: Your Company

Sampler (Name): Your Name

Sampler Signature: Your signature

3. Type of Activity: ENF [X], ER [ ], LSI [ ], NPLD [ ], PA [ ], RA [ ], RD [ ], ST [ ], STSI [ ], O&M [ ], RI/FS [ ], SSI [ ], STPA [ ], Other [ ]

4. Date Shipped: 3/1/91 | Carrier: Fed-EX

Airbill Number: 5678901

5. Ship To: Lab Name, Address, Attn: ———

6. Preservative (Enter in Column D): 1 HCl, 2 HNO3, 3 Na_2SO_4, 4 H_2SO_4, 5 Other (SAS) (Specify), 6 Ice only, N Not preserved

7. Sample Description (Enter in Column A): 1. Surface Water, 2. Ground Water, 3. Leachate, 4. Rinsate, 5. Soil/Sediment, 6. Oil (SAS), 7. Waste (SAS), 8. Other (SAS) (Specify)

Triple volume required for matrix spike/matrix spike duplicate analysis sample. Ship medium and high concentration samples in paint cans. See reverse for additional standard instructions. Please indicate sample to spike/duplicate.

CLP Sample Numbers (from labels)	A Enter # from Box 7	B Conc Low Med High	C Sample Type: Comp / Grab	D Preservative from Box 6	E RAS Analysis: VOA	BNA	Pest/PCB	High ARO/TOX	F Regional Specific Tracking Number or Tag Numbers	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Inorg. Samp. No.	
EA101	1	L	G	1	X				5-169813→14	MW-01	3/1/91 9:00		MEA01	
EA102	1	L	G	1	X				5-169815→16	MW02	3/1/91 10:00			
EA102	1	L	G	N		X	X		5-169817→18	MW02	3/1/91 10:00		MEA02	Field dups: EA103
EA103	1	L	G	1	X				5-169819→20	MW-03	3/1/91 11:00		MEA03	
EA10														

Shipment for Case complete? (Y/N)

TR COC # 34813 - 34814

CHAIN OF CUSTODY RECORD

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Signature	3/1/91 17:00				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks: Is custody seal intact? Y/N/none	

Inorganic Traffic Report

(For Inorganic CLP Analysis)

EPA — United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703 557 2490 FTS 557-2490

SAS No. (If applicable):

Case No.: 12345

1. Project Code	Account Code	2. Region No.	Sampling Co.	4. Date Shipped	Carrier	6. Preservative (Enter in Column D)	7. Sample Description (Enter in Column A)	Double volume required for spike/duplicate analysis sample.
		V	Your Company	3/1/91	FedEx	1. HNO_3 2. NaOH 3. HCl 4. H_2SO_4 5. Ice only 6. Other (SAS) (Specify) N. Not preserved	1. Surface Water 2. Ground Water 3. Leachate 4. Rinsate 5. Soil/Sediment 6. Oil (SAS) 7. Waste (SAS) 8. Other (SAS) (Specify)	Ship medium and high concentration samples in paint cans.

Regional Information:

Non-Superfund Program:

Site Name: Landfill

City, State: Chicago, IL

Site Spill ID: ZZ

Sampler (Name): Your Name

Sampler Signature: Your Signature

3. Type of Activity: ENF [X], ER [ ], LSI [ ], NPLD [ ], PA [ ], RA [ ], RD [ ], STSI [ ], O&M [ ], RI/FS [ ], SSI [ ], ST [ ], STPA [ ], Other [ ]

Airbill Number: 1234567

5. Ship To: Lab Name, Address, Attn:

See reverse for additional standard instructions.

For total or dissolved metals, check only one RAS analysis per each sample.

CLP Sample Numbers (from labels)	A Enter # from Box 7	B Conc. Low Med High	C Sample Type: Comp / Grab	D Preservative from Box 6	E - RAS Analysis: Metals Total	Metals Dissolved	Cyanide	Low Conc. Mercury/Hydride	Low Conc. Furnace	High pH	High Conductivity	F Regional Specific Tracking Number or Tag Numbers	G Station Location Number	H Mo/Day/Year/Time Sample Collection	I Sampler Initials	J Corresp. CLP Org. Samp. No.	
MEA01	1	L	G	1	X							5-169803	MW-01	3/1/91 9:00		EA101	
MEA01	1	L	G	2			X					5-169804	MW-01	3/1/91 9:00			
MEA02	1	L	G	1	X							5-169805	MW-02	3/1/91 10:00		EA102	
MEA02	1	L	G	2			X					5-169806	MW-02	3/1/91 10:00			
MEA03	1	L	G	1	X							5-169807	MW-03	3/1/91 11:00		EA103	
MEA03	1	L	G	2			X					5-169808	MW-03	3/1/91 11:00			Field dups: MEA03 MEA04
MEA04	1	L	G	1	X							5-169809	MW-03	3/1/91 12:00		EA104	
MEA04	1	L	G	2			X					5-169810	MW-03	3/1/91 12:00			
MEA05	3	L	G	1	X							5-169811	FB-01	3/1/91 13:00			Field Blank
MEA05	3	L	G	2			X					5-169812	FB-01	3/1/91 13:00		EA105	

Shipment for Case complete? (Y/N): Y

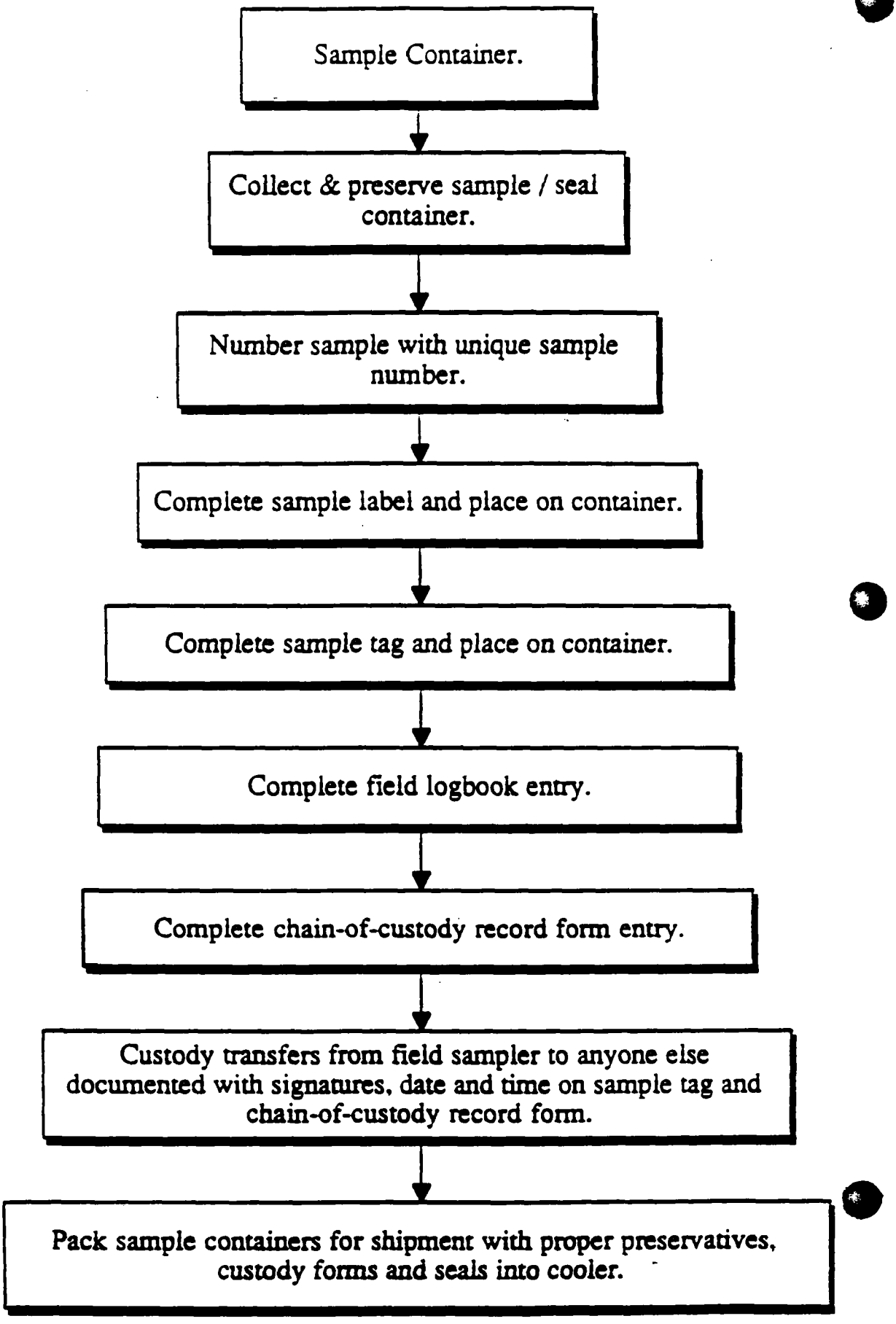
USE MEA01 for spike.
USE MEA02 for dup.

TR COC Seal #s 34815-34812

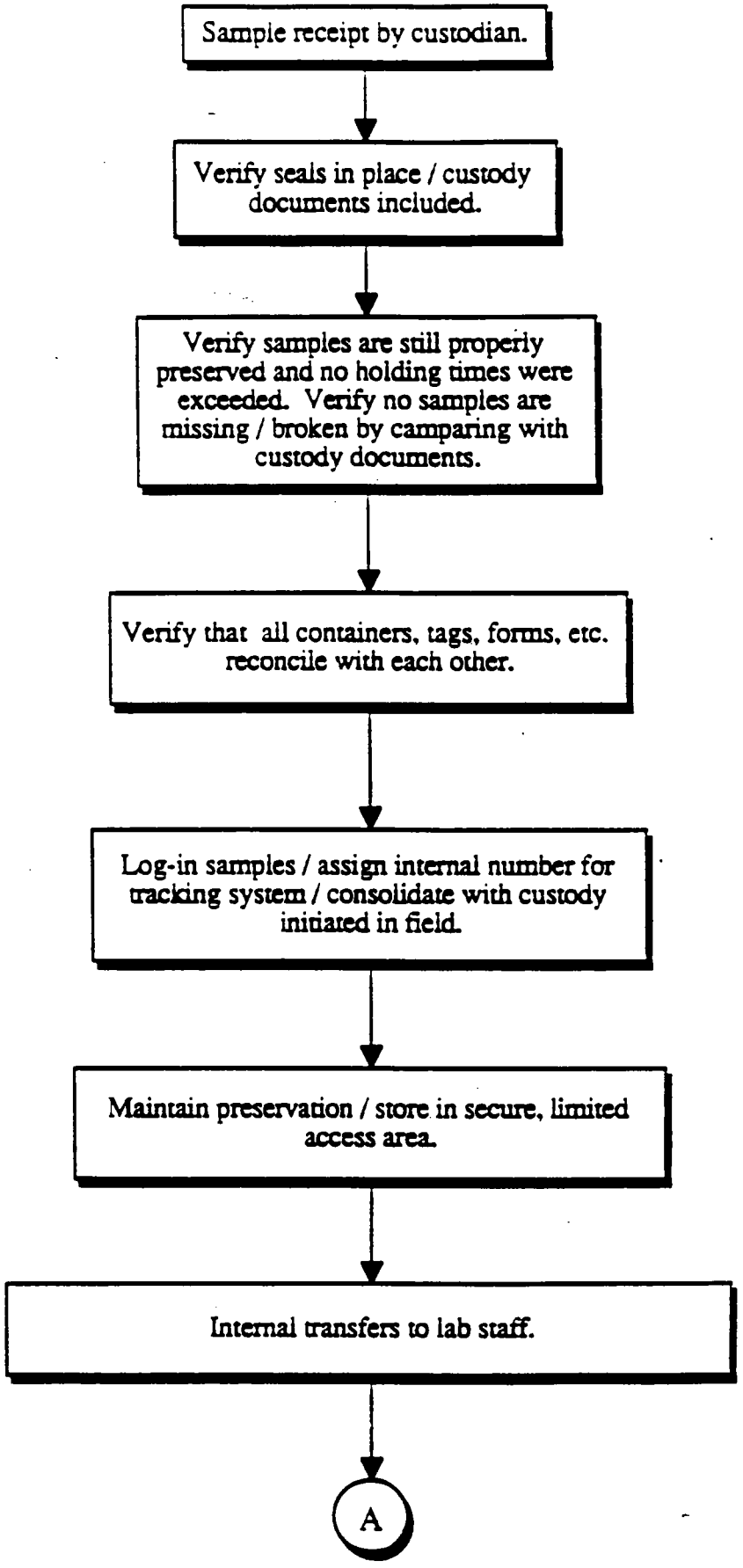
CHAIN OF CUSTODY RECORD

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Signature	3/1/91 17:00				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Received by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks Is custody seal intact? Y/N/none	

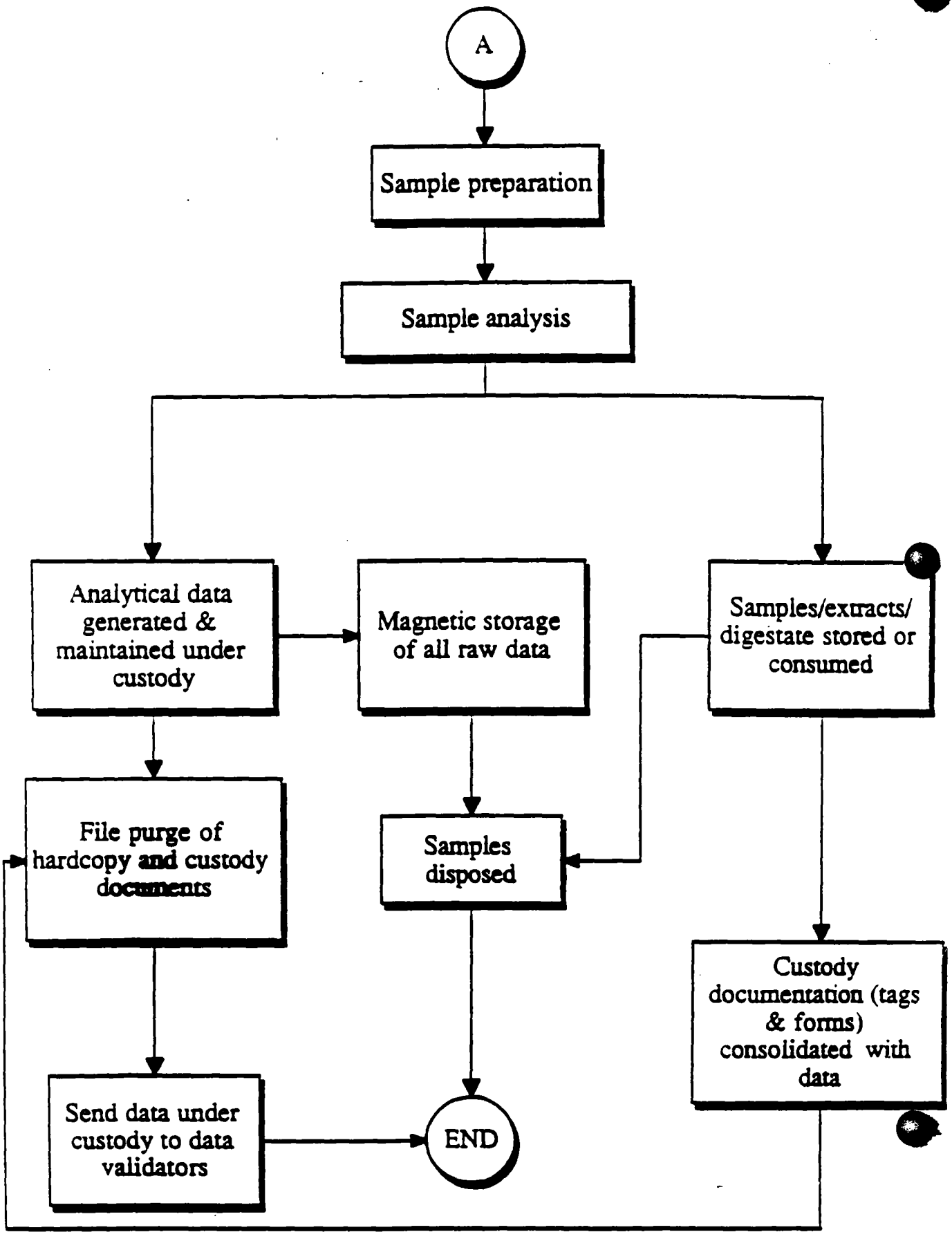
EXAMPLE FIELD CUSTODY SEQUENCE



EXAMPLE LAB CUSTODY SEQUENCE



EXAMPLE LAB CUSTODY SEQUENCE (continued)



APPENDIX VI
REFERENCES

The following References comprise relevant guidance documents and other information which should be used in implementing this RCRA §3008(h) Consent Order. This list does not include every guidance document pertaining to work performed under a RCRA §3008(h) Consent Order. The list is organized according to the relevant section of the Consent Order. Contacts for additional information are included at the end of this list.

MODEL ORDER:

Section VIII.: Work to be Performed

"Handbook: Stabilization Technologies for RCRA Corrective Actions," EPA/625/6-91/026, August 1991.

"RCRA Ground-Water Monitoring: Draft Technical Guidance," EPA/530-R-93-001, November 1992.

"Interim Final RCRA Facility Investigation (RFI) Guidance," Volumes I - IV, EPA/530/SW-89-031, May 1989.

"RCRA Ground-water Monitoring Technical Enforcement Guidance Document (TEGD)," OSWER Directive 9950.1, September 1986.

Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001, November 1992.

"Handbook: Ground Water," Volumes I and II, EPA/625/6-90/016 (a&b), September 1990 and July 1991.

"Ground-Water Modeling: An Overview and Status Report," EPA/600/2-89/028, December 1988.

"Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities," Addendum to Interim Final Guidance, EPA/530-R-93-003, July 1992; Interim Final EPA/530/SW-89/026, April 1989.

"Data Quality Objectives for Remedial Response Activities," EPA/540/G-87/003 & 004, OSWER Directive 9335.0-7B, March 1987.

"Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.

"Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A)," Interim Final, EPA/540/1-89/002, December 1989.

"Risk Assessment Guidance for Superfund, Volume II: Environmental Evaluation Manual," Interim Final, EPA/540/1-89/001, March 1989.

"Final Guidance for Data Useability in Risk Assessment," (Parts A & B), OSWER Directive 9285.7-09A, April 1992.

"Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference Document," EPA 600/3-89/013, March 1989.

"A Compendium of Superfund Field Operations Methods," Two Volumes, EPA/540/P-87/001a&b, OSWER Directive 9355.0-14, August 1987.

"Technical Guidance Document: Construction Quality Assurance for Hazardous Waste Land Disposal Facilities," EPA 530/SW-86/031, OSWER Directive 9472.003, October 1986.

"Corrective Measures for Releases to Ground Water from SWMUs," Draft Final, EPA/530-SW-88-020, March 1985.

"Technical Guidance for Corrective Measures--Determining Appropriate Technology and Response for Air Releases," Draft Final, EPA/530-SW-88-021, March 1985.

"Air/Superfund National Technical Guidance Study Series," Volumes I-IV, EPA 450/1-89-001,002,003,004 (1989 and 1990).

"Corrective Measures for Releases to Soil from SWMUs," Draft F EPA/530-SW-88-022, March 1985.

"Technical Guidance for Corrective Measures -- Subsurface Gas," EPA/530-SW-88-023, March 1985.

"Guide for Conducting Treatability Studies under CERCLA," Interim Final, EPA/540/2-89/058.

"Selected Alternative and Innovative Treatment Technologies for Corrective Action and Site Remediation," EPA/540/8-91/092, 1991.

"Synopses of Federal Demonstrations of Innovative Site Remediation Technologies," EPA/540/8-91/009, May 1991.

"Bibliography of Federal Reports and Publications Describing Alternative and Innovative Treatment Technologies for Corrective Action and Site Remediation," EPA/540/8-91/007, May 1991.

Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments," EPA/530/SW-89/047, July 1989.

"Handbook on In-Situ Treatment of Hazardous Waste-Contaminated Soils," EPA/540/2-90/002, January 1990.

"Stabilization/Solidification for CERCLA and RCRA Wastes,"

EPA/625/6-89/022, May 1989.

"Health and Safety Requirements of Employees Employed in Field Activities," EPA Order 1440.2, July 12, 1981.

Section XI.: Quality Assurance

"Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAMS-005/80, December 29, 1980.

GENERAL INFORMATION:

"OSWER Directives - System Catalog," OSWER Directive 9013.15-3D, March 1992. (Provides a list of OSWER Directives published through March 1991.)

"Technical Support Services for Superfund Site Remediation and RCRA Corrective Action" (third edition), EPA/540/8-91/091, March 1992.

"Accessing Federal Data Bases for Contaminated Site Clean-Up Technologies," EPA/540/8-91/008, May 1991.

"Memorandum on the Use of Supplemental Environmental Projects, Amendment to GM 22," James M. Strock, February 12, 1991.

USEFUL TELEPHONE NUMBERS:

RCRA/CERCLA/UST Hotline (800) 424-9346

EPA's Office of Research and Development publishes occasional ground water and engineering issue papers. For information contact: ORD Publications Office, Center for Environmental Research Information (CERI), (513) 569-7562

National Technical Information Services (NTIS) (703) 487-4650 / (800) 553-6847

David C. Batson, U.S. EPA's ADR Liason, Office of Enforcement (202) 260-8173

SIGNATURE/INITIAL CONCURRENCE REQUESTED - RCRA ENFORCEMENT BRANCH (REB)								
SC/BR/OFC SECRETARY								
INITIATOR /AUTHOR	IL/IN TES CHIEF	MI/WI TES CHIEF	MN/OH TES CHIEF	IL/MI/WI EPS CHIEF	IN/MN/OH EPS CHIEF	REB BRANCH CHIEF	RCRA ASSOC. DIR.	WMD DIVISION DIRECTOR
2/14/94		2/15/94				2/15/94	2/15/94	

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UNITED STATES OF AMERICA
IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

FRANK J. KELLEY, Attorney General for the State of Michigan, ex rel MICHIGAN NATURAL RESOURCES COMMISSION, MICHIGAN WATER RESOURCES COMMISSION, and DR. RONALD SKOOG, Ph.D., Director of the Michigan Department of Natural Resources,

Plaintiff,

vs.

BASF WYANDOTTE CORPORATION,

Defendant.
_____/

Civil Action
No. 83-CV-4712-DT

Judge Avern Cohn

ORDER AMENDING CONSENT DECREE

At a session of said Court held in the City of Detroit, Michigan on Sept 4, 1987.

PRESENT: HONORABLE Avern Cohn
United States District Judge

This matter comes before the Court on the Stipulation of counsel for Plaintiff and Defendant and Amicus Curiae, City of Wyandotte to amend certain provisions in the Consent Decree entered by this Court on January 6, 1986 and the Court being fully advised in the premises;

IT IS HEREBY ORDERED that Paragraph A (Remedial Program for Area A) on page 1 of Appendix C be deleted and a new

Paragraph A in the form attached to this Order be substituted in its place.

IT IS FURTHER ORDERED that Exhibit III to Appendix C be deleted and a new Exhibit III in the form attached to this Order be substituted in its place.

Dated: ~~July , 1986~~
SEP 04 1986

U.S. District Judge

S O U T H W O R K S

REMEDIAL PROGRAM

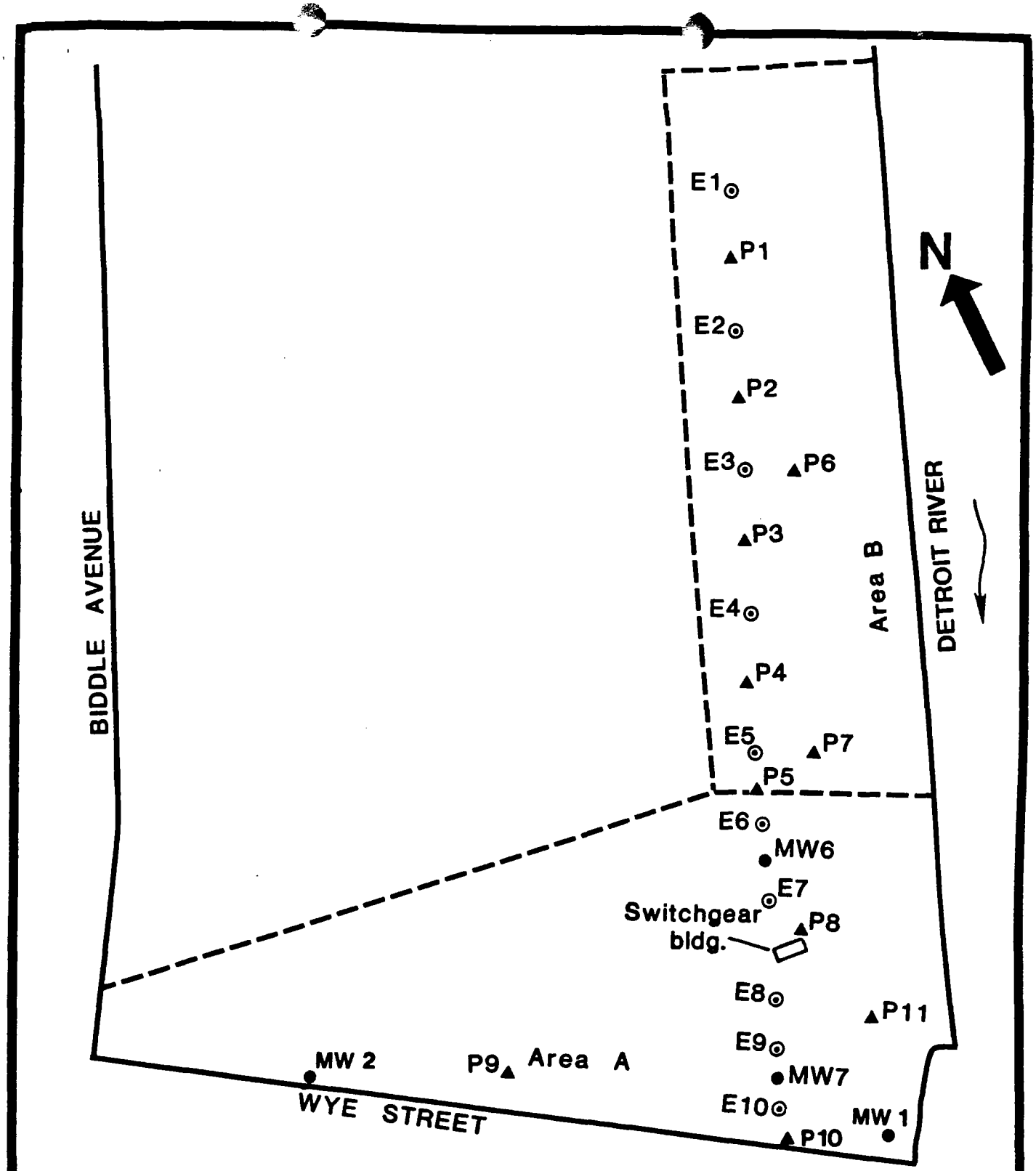
A. REMEDIAL PROGRAM FOR AREA A

Area A is located in the southeast corner of the South Works adjacent to the Detroit River (Exhibit I).

The groundwater in this area of the site flows in the general direction of the southeastern boundary of the site (Exhibit II). Groundwater extraction wells will be installed as shown on Exhibit III along a north-south line located 200± 50 feet west of the Detroit River shoreline. The construction details for the extraction wells are shown in Exhibit VI of this appendix. The number of wells and the rate of withdrawal of water therefrom shall at all times be sufficient to halt the flow of contaminated groundwater from Area A to the Detroit River and Wye Street by maintaining groundwater levels in each extraction well at elevation 568 feet or lower. Samples will be collected from the combined flow of all extraction wells in June and October of each year the system is in operation and analyzed for 1,2-dichloropropane, tetracholoroethylene and hexachlorobenzene.

Two (2) monitor wells shall be installed at the approximate locations shown on Exhibit III to monitor the effectiveness of the extraction system, one located between extraction wells E6 and E7 and the other located between extraction wells E9 and E10.

BWC shall maintain the extraction wells including cleaning, replacement of screens and replacement of any extraction well that will not produce water due to failure of well components. Water removed by the extraction wells shall be discharged to the Wayne County Department of Public Works' wastewater treatment plant in accordance with a discharge permit issued by Wayne County to BWC. A piezometer system shall be installed at the approximate locations shown on Exhibit III. Water levels in the piezometer and monitor wells MW6 and MW7 will be measured on the schedule established in paragraph F of this appendix.



LEGEND

MW 1 • Monitoring well
E1 ⊙ Extraction well
P1 ▲ Piezometer

200 0 200
scale feet

BASF Wyandotte Corporation
SOUTH WORKS

EXHIBIT III
REMEDIAL PLAN FOR
AREAS A AND B

UNITED STATES OF AMERICA
IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

FRANK J. KELLEY, Attorney General for the State of Michigan, ex rel MICHIGAN NATURAL RESOURCES COMMISSION, MICHIGAN WATER RESOURCES COMMISSION, and DR. RONALD SKOOG, Ph.D., Director of the Michigan Department of Natural Resources,

Plaintiff,

vs.

BASF WYANDOTTE CORPORATION,

Defendant.
_____/

Civil Action
No. 83-CV-4712-DT

Judge Avern Cohn

STIPULATION TO AMEND CONSENT DECREE

IT IS HEREBY STIPULATED AND AGREED that:

(1) Paragraph A (Remedial Program for Area A) on page 1 of Appendix C be deleted and a new Paragraph A in the form attached to this Stipulation be substituted in its place.

(2) Exhibit III to Appendix C be deleted and a new Exhibit III in the form attached to this Stipulation be

substituted in its place.

Dated: ~~July~~ August 25, 1986

FRANK J. KELLEY,
Attorney General
For the State of Michigan

By: _____
Stephen F. Schuesler (P23658)
Assistant Attorney General
Environmental Protection Division
720 Law Building
Lansing, Michigan 48913

Attorneys for Plaintiffs

HOUGHTON, POTTER, SWEENEY & BRENNER

By: _____
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3300 Guardian Building
Detroit, Michigan 48226

Attorneys for Defendant
BASF Wyandotte Corporation

LOOK, KALMBACH & LOOK

By: _____
William R. Look (P28563)
2241 Oak Street
Wyandotte, Michigan 48192

Attorneys
Amicus Curiae
City of Wyandotte

S O U T H W O R K S

REMEDIAL PROGRAM

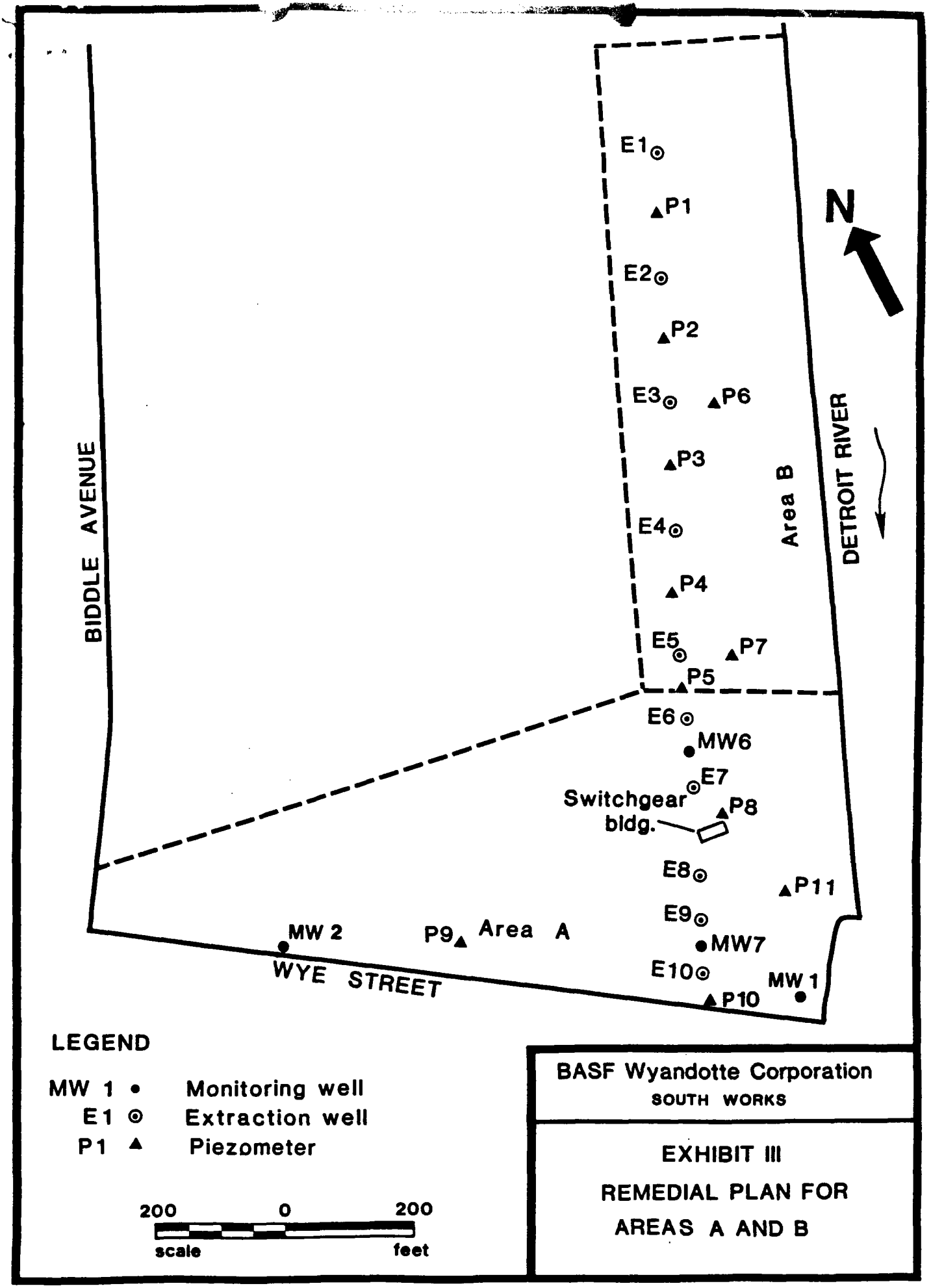
A. REMEDIAL PROGRAM FOR AREA A

Area A is located in the southeast corner of the South Works adjacent to the Detroit River (Exhibit I).

The groundwater in this area of the site flows in the general direction of the southeastern boundary of the site (Exhibit II). Groundwater extraction wells will be installed as shown on Exhibit III along a north-south line located 200± 50 feet west of the Detroit River shoreline. The construction details for the extraction wells are shown in Exhibit VI of this appendix. The number of wells and the rate of withdrawal of water therefrom shall at all times be sufficient to halt the flow of contaminated groundwater from Area A to the Detroit River and Wye Street by maintaining groundwater levels in each extraction well at elevation 568 feet or lower. Samples will be collected from the combined flow of all extraction wells in June and October of each year the system is in operation and analyzed for 1,2-dichloropropane, tetracholoroethylene and hexachlorobenzene.

Two (2) monitor wells shall be installed at the approximate locations shown on Exhibit III to monitor the effectiveness of the extraction system, one located between extraction wells E6 and E7 and the other located between extraction wells E9 and E10.

BWC shall maintain the extraction wells including cleaning, replacement of screens and replacement of any extraction well that will not produce water due to failure of well components. Water removed by the extraction wells shall be discharged to the Wayne County Department of Public Works' wastewater treatment plant in accordance with a discharge permit issued by Wayne County to BWC. A piezometer system shall be installed at the approximate locations shown on Exhibit III. Water levels in the piezometer and monitor wells MW6 and MW7 will be measured on the schedule established in paragraph F of this appendix.


E1
P1
N
E2
P2
E3
P6
P3
BIDDLE AVENUE
Area B
DETROIT RIVER
E4
P4
E5
P7
P5
E6
MW6
E7
Switchgear
bldg.
P8
E8
P11
E9
MW 2
P9
Area A
MW7
WYE STREET
E10
MW 1
P10
LEGEND
MW 1 • Monitoring well
E1 ⊙ Extraction well
P1 ▲ Piezometer
200 0 200
scale feet
BASF Wyandotte Corporation
SOUTH WORKS
EXHIBIT III
REMEDIAL PLAN FOR
AREAS A AND B

11/07/85

11/12/85R

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UNITED STATES OF AMERICA
IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

FRANK J. KELLEY, Attorney General for the State of Michigan, ex rel MICHIGAN NATURAL RESOURCES COMMISSION, MICHIGAN WATER RESOURCES COMMISSION, and DR. RONALD SKOOG, Ph.D., Director of the Michigan Department of Natural Resources

Plaintiffs,

vs.

Civil Action
No. 83-CV-4712-DT

BASF WYANDOTTE CORPORATION,

Judge Avern Cohn
P-12030

Defendant.

CONSENT DECREE

The parties, Frank J. Kelley, Attorney General for the State of Michigan, Frank J. Kelley, ex rel. Michigan Natural Resources Commission, Michigan Water Resources Commission, and the Director of the Michigan Department of Natural Resources (hereinafter jointly referred to as "MDNR"), and BASF Wyandotte Corporation (hereinafter "BWC"), by their respective attorneys, having consented to the entry of this Consent Decree,

NOW, THEREFORE, before the taking of any testimony, upon the pleadings, and without admission or adjudication of any issue of

LD41-95,100

fact or law herein, it is hereby ORDERED, ADJUDGED, AND DECREED as follows:

I. JURISDICTION

This Court has jurisdiction over the parties and subject matter of this action under 28 U.S.C. §1331, 42 U.S.C. §9613 and 42 U.S.C. §6972. This Court further has pendent jurisdiction of the parties and subject matter of this action with regard to claims under State of Michigan 1929 PA 245, as amended, MCL 323.1 et. seq., the Water Resources Commission Act, and 1970 PA 127, MCL 691.1201 et. seq., the Anderson-Rockwell Environmental Protection Act.

II. PARTIES BOUND

This Consent Decree shall apply to and be binding upon the parties to this Consent Decree, their officers, employees, agents, successors and assigns, and upon all persons, firms, subsidiaries and corporations acting under, through or for, or in active concert or participation with the parties in the performance of any obligations hereunder.

III. THE SITES

The property which is the subject of this Consent Decree (hereinafter "the Sites") is commonly referred to as the "North Works" and the "South Works" of BASF WYANDOTTE CORPORATION, and is located in the City of Wyandotte, Michigan. A description of the Sites appears in Appendix A.

IV. PURPOSE OF THIS CONSENT DECREE

It is the mutual intent and purpose of the parties that BWC shall, at its own and sole expense, control conditions at the Sites which could endanger public health, welfare, or the environment and take measures to prevent the flow of contaminated groundwater from the Sites to the Detroit River by undertaking the specific activities set forth in Section V of this Consent Decree.

V. REMEDIAL PROGRAMS

BWC shall accomplish programs of remedial action at the Sites, consisting of a site modification program, a monitoring program, and a maintenance program. The remedial action programs for the North and South Works are set forth in Appendix B and Appendix C attached hereto.

VI. DISCONTINUANCE OF OPERATION OF REMEDIAL ACTION PROGRAM

A. BWC shall give notice to MDNR of its intent to discontinue operation of any remedial program herein. Notice of BWC's intent to shut down any groundwater monitoring, collecting or treating system described by this document shall precede the shut down by at least sixty (60) days. MDNR shall respond affirmatively or negatively to such notice within sixty (60) days.

No remedial system within a particular area of the South Works may be discontinued prior to the expiration of thirty (30) years from the date of entry of this Decree unless BWC has given the notice described in this paragraph and can demonstrate that the required concentration levels of contaminants have been achieved in each well or drain comprising the system in that particular area and in each monitor well in the area served by the system for the required sampling period specified for that particular area; provided however, that if any remedial system on the South Works has not been certified operational pursuant to Paragraph IX.D. within eighteen (18) months of entry of this Consent Decree, the thirty (30) year period shall begin to run from the date that such system has been certified operational. If BWC wishes to discontinue collecting the groundwater at any individual extraction system within a particular remedial system on the South Works, the procedure set forth in Paragraph F.3. in Appendix C will control.

No extraction well system within a particular area of the North Works, nor the treatment system serving any such extraction well system, may be discontinued prior to thirty (30) years from the date that such systems become operational unless BWC has given such notice and can demonstrate that the required concentration levels of influent and effluent of the treatment system and in each monitor well in the area served by the extraction well system have been achieved for the required sampling period specified for that particular area. If BWC wishes to discontinue any individual wells within an extraction well system or treatment system on the North Works, the procedure set forth in Paragraph D of Appendix B will control.

A dispute by the parties regarding the adequacy of any demonstration under VI.A. shall be resolved by the Court. In the resolution of any such dispute, BWC shall bear the burden of persuasion by a preponderance of the evidence.

B. Before the operation of any remedial system is discontinued, MDNR may request that such system be modified, relocated or continued. BWC shall respond to such a request within sixty (60) days. Any disagreement by the parties regarding modification, relocation or continued operation of any system shall be resolved by the Court. Except as provided in VI.A., MDNR shall bear the burden of persuasion by a preponderance of the evidence that such

modification, relocation and/or continued operation is necessary to protect the public health, welfare or the environment.

C. Where MDNR is requesting modification, relocation and/or operation of a remedial system beyond thirty (30) years from the date of entry of this Consent Decree, MDNR shall bear the burden of persuasion by a preponderance of the evidence that such modification, relocation and/or continued operation is necessary to protect the public health, welfare or the environment.

D. In the event of any dispute under this paragraph, no system shall be discontinued until ordered by the Court.

VII. APPROVALS; NOTICE OF DISAPPROVAL OR INADEQUACY

A. Approvals

Except as otherwise specifically provided in this Consent Decree or the Appendices, the approval of any proposed action, or of any certification, report, information or data submitted by BWC to MDNR pursuant to this Consent Decree, shall be effective either upon written notice to BWC or upon the expiration of a period of sixty (60) days from the receipt of notice of the proposed action or of such certification, report, information or data by MDNR, whichever shall occur earlier. This 60-day period may be extended upon agreement between BWC and MDNR.

B. Notice of Disapproval or Inadequacy

Except for those actions referred to in Section XII of the Consent Decree, in the event MDNR should disapprove or find inadequate any proposed action, or any certification, report, information, or data submitted by BWC under this Consent Decree, it shall provide written notice thereof to BWC within 60 days of receipt of a notice of a proposed action or of such certification, report, information or data, which notice shall include:

1. A detailed statement of the bases for MDNR's conclusion or request;

2. A description of what further action in its opinion is required to fulfill or effectuate any provisions of this Consent Decree, such description to include, without limitation, the need for verification of data or for obtaining additional data or for implementing specified actions; and

3. A proposed schedule for submission of any additional information.

It is the intent of the parties that this notice fully set forth and describe any disapproval or finding of inadequacy and the bases therefore; however, an insufficiency in the notice

shall not be deemed a waiver by MDNR of any such disapproval or finding of inadequacy.

C. Submission to Court

In the event an agreement cannot be reached between BWC and MDNR concerning MDNR's disapproval or finding of inadequacy, BWC shall file a petition with the Court setting forth the matter in dispute. In any proceedings on such petition, BWC shall have the burden of persuasion by a preponderance of the evidence unless the burden of persuasion is assumed by MDNR under any other provision of this Consent Decree.

D. Resolution of Disputes During Course of Site Modification Program

In the event a dispute should arise between BWC and MDNR during construction of the Site Modification Program, BWC shall, upon demand by MDNR, stop construction and shall, unless the dispute is resolved, file a petition with the Court setting forth the matter in dispute.

VIII. DELAY IN PERFORMANCE

If any event occurs which delays or could delay the timely achievement of the requirements of this Consent Decree (including any delays resulting from the obtaining of any necessary permits), BWC shall notify MDNR within three days in writing of

the delay or anticipated delay as appropriate, describing in detail the anticipated length of the delay, the cause or causes of delay, the measures taken and to be taken by BWC to prevent or minimize the delay, the schedule by which these measures will be implemented, and requesting approval of a revised schedule. If the delay or anticipated delay has been or will be caused by circumstances beyond the reasonable control of BWC, the time for performance hereunder shall be extended for a reasonable period of time as is appropriate under the circumstances, provided that an extension of the time for performance of one event shall not necessarily entail an extension of the time for performance of subsequent events. Increased costs of performance of the requirements of this Consent Decree shall not be circumstances beyond the reasonable control of BWC justifying an extension in the time for performance. In the event MDNR disapproves BWC's request for a delay in performance, BWC may promptly submit the matter to this Court for resolution in accordance with Section VII.C.

IX. COORDINATION AND NOTIFICATION

A. Designation of Coordinator

The parties shall designate a coordinator and an alternate within 15 days following entry of this Consent Decree. At any

time, the parties may appoint new coordinators, alternates or both and shall so advise the other parties in writing. To the maximum extent possible, communications between the parties shall be made between coordinators. Whenever, pursuant to this Consent Decree, a report, notice, approval or other document is required to be forwarded by one party to another, it shall be sent by certified or registered mail, return receipt requested, to the attention of the coordinators at the addresses specified below.

To MDNR: Director
Michigan Department of Natural Resources
Box 30028
Lansing, Michigan 48909

To BWC: General Manager
Wyandotte Works
BASF Wyandotte Corporation
1609 Biddle Avenue
Wyandotte, Michigan 48192

B. Designation of Field Representative

MDNR shall designate a field representative and an alternate within fifteen (15) days following entry of this Consent Decree. The field representative shall have authority to act on behalf of MDNR on matters relating to the site work, measurements during construction, and compliance with the specifications of this Consent Decree. The MDNR field representative shall be available for consultation during construction activities, which activities

will be scheduled by BWC and its contractors. In the event of a disagreement among the BWC project manager and the MDNR field representative, the matter shall be referred to the coordinators for resolution. In the event the matter is not resolved by the coordinators, BWC shall file a petition with the Court in accordance with Section VII.C. of this Consent Decree.

C. Notice of Commencement of Construction

BWC shall provide written notice to the MDNR coordinators and to the Attorney General of Michigan at least thirty (30) days prior to the commencement of construction of the Site Modification Program set out in Section V. Subsequent notice of construction activities shall be based upon a written schedule provided by the BWC project manager to the MDNR field representative.

D. Certification of Completion by BWC

On or before December 31, 1986, BWC shall provide to MDNR a final certification that the Site Modification Program described in Section V of this Consent Decree has been completed and placed in operation in accordance with the requirements of this Consent Decree.

X. INFORMATION

All data, information and other documents in the possession of BWC and not privileged, which relate to obligations undertaken by BWC pursuant to this Consent Decree, shall be provided by BWC to MDNR upon request. Documents or information entitled to confidentiality under applicable Michigan law shall be disclosed by MDNR only in accordance with the procedure set out in MCL 299.528.

XI. ACCESS TO SITES

A. Access by MDNR Representative

BWC shall permit the MDNR field representative, and such other agency employees, contractors and consultants as the field representative requires to assist him in his duties under this Consent Decree, to enter the Sites at all reasonable times. The field representative and the persons assisting him shall at all times observe Michigan OSHA, OSHA, NIOSH, and any applicable EPA rules.

B. Taking of Samples

BWC or MDNR may take any samples from the North or South Works to demonstrate or check compliance with this Consent

Decree. Such samples shall be split with the other parties upon request. Any analysis not covered by Section V. shall be conducted in accordance with then-currently applicable laws, regulations or such other analytical procedures as may be agreed upon by BWC and MDNR.

C. No Limitation on Entry

Nothing in this Consent Decree is intended to limit in any way the right of entry or inspection or sampling of MDNR that it may otherwise have by operation of any law.

XII. SALE OR LEASE OF NORTH OR SOUTH WORKS SITES

Should BWC sell or lease any portion or all of the North or South Works during the term of the remedial action program set forth in this Consent Decree, BWC shall retain legal right of access (whether by easement or otherwise) to those portions of the North or South Works where subsurface drains, groundwater extraction wells, pumping systems, discharge systems, monitor wells and piezometers, etc., are located to ensure that its obligations under the Consent Decree can be carried out. Sixty (60) days prior to any intended sale or lease, BWC shall deliver to MDNR and the Attorney General of Michigan copies of any proposed documents retaining such legal right of access, which docu-

ments shall demonstrate that BWC has in fact retained legal right of access (whether by easement or otherwise) to those portions of the North and South Works where subsurface drains, groundwater extraction wells, pumping systems, discharge systems, monitor wells and piezometers, etc., are located to ensure that its obligations under the Consent Decree can be carried out. The State shall have sixty (60) days from receipt of such documents to object in writing thereto. Any objection by the State shall specify in detail how such documents are inadequate to ensure the discharge of BWC's obligations under the Consent Decree. Any dispute by the parties shall be resolved by the Court in accordance with Section VII.C. hereof, except that MDNR shall bear the burden of persuasion by a preponderance of the evidence.

XIII. FINANCIAL RESPONSIBILITY

A. Funding of Capital Expenditures

BWC shall fund all capital expenditures and pay all expenses necessary to accomplish the measures set forth in this Consent Decree except that BWC shall not reimburse MDNR for any of its expenses in connection with this Consent Decree, other than those provided for in Section XV.

B. Certification of Net Worth

1. Upon entry of this Consent Decree with the Court, BWC shall submit to MDNR either a statement certified by its chief financial officer that its net worth is not less than Twenty Million ($20,000,000) Dollars or a copy of its financial statements for the fiscal year last ended, showing a net worth of not less than Twenty Million ($20,000,000) Dollars. If at any time prior to the completion of the construction of the remedial programs described in Appendix B or C BWC's net worth decreases to below Twenty Million ($20,000,000) Dollars, BWC shall immediately notify MDNR and shall promptly provide security in an amount sufficient for the performance of BWC's obligations hereunder through the completion of construction. Such security may take the form of a performance bond, a letter of credit, the guaranty

of a corporation having a net worth of not less than twenty Million ($20,000,000) Dollars, or such other form of security to which the parties may hereafter agree.

2. If, subsequent to the completion of construction, but prior to the termination of BWC's other obligations under this Consent Decree, BWC's net worth decreases to below Ten Million ($10,000,000) Dollars, BWC shall immediately notify MDNR, and shall promptly provide security in an amount sufficient for the performance of BWC's remaining obligations under this Consent Decree. Such security may take the form of a performance bond, a letter of credit, the guaranty of a corporation have a net worth of not less than Ten Million ($10,000,000) Dollars, or such other form of security to which the parties may hereafter agree.

XIV. SETTLEMENT, RELEASES, AND EFFECT OF THIS CONSENT DECREE ON OTHER LAWS AND THIRD PARTIES

A. All Work to be Done in Accordance With Applicable Laws and Regulations

All work undertaken by BWC pursuant to this Consent Decree is to be performed in accordance with all federal, state and local statutes, regulations and ordinances including, but not limited to, the Occupational Safety and Health Act, 29 U.S.C. 651, et seq., Clean Water Act, 33 U.S.C. 1251, et seq., the Water Resources Commission Act, 1929 PA 245, as amended, MCL 323.1, et

seq., and the Anderson-Rockwell Environmental Protection Act, 1970 PA 127, MCL 691.1201, et seq.

B. No Admissions

This Consent Decree represents a compromise of disputed issues and facts and BWC expressly makes no admission of fact or liability concerning any acts or liabilities asserted against it in this action. Nothing contained in this Consent Decree shall be deemed an admission of fact or liability or evidence of same, nor of any violation of law or regulation.

C. Rights of Third Parties Not Affected

This Consent Decree shall neither create nor affect rights of persons or entities who are not parties of this Consent Decree and who are not described in Section II. of this Consent Decree.

D. No Waiver of Claims Against Third Parties

The State of Michigan does not waive any claims or rights it may have against any person or entity not a party to this Consent Decree.

E. Release

The execution by the parties and the entry by the Court of this Consent Decree shall constitute full settlement of the

claims asserted, or which could have been asserted, on behalf of the Plaintiffs and the State of Michigan in this action and shall constitute a full discharge and release of BWC, its subsidiaries, parent companies, predecessors, affiliates, successors and assigns, and its and their officers, directors, agents and employees from any liability of any kind or nature whatsoever under, but not limited to, the Resource Conservation and Recovery Act, 42 U.S.C. §6901 et seq., the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §9601 et seq., the Water Resource Commission Act, 1929 PA 245, MCL §323.1 et seq., the Anderson-Rockwell Environmental Protection Act, 1970 PA 127, MCL §691.1201 et seq., and any other statute, common law, regulation or rule of the United States of America or the State of Michigan, resulting from or in any way relating to

1. The disposal or presence of known chemicals or other known substances at, on or under the Sites prior to the entry of this Consent Decree;

2. The continuing presence of such known chemicals or other known substances at, on or under the Sites subsequent to the entry of this Consent Decree;

3. The migration, discharge or release of such known chemicals or other known substances from the Sites prior to the completion of construction of the Site Modification

Program referred to in Section V. of this Consent Decree; and

4. The migration, discharge or release of such known chemicals or other known substances from the Sites subsequent to completion of construction of the Site Modification Program referred to in Section V. of this Consent Decree, unless such migration, discharge or release results from a violation of this Consent Decree or any discharge permit.

"Known chemicals or other known substances" means chemicals or substances known by MDNR to be present at the Sites as of the date of entry of this Consent Decree.

The State of Michigan specifically retains the right and authority to enforce the terms of this Consent Decree.

XV. COSTS

Within fifteen (15) days after entry of this Consent Decree, BWC shall pay the State of Michigan, c/o Chief, Environmental Protection Division, Department of the Attorney General, the sum of Two Hundred Ninety Thousand ($290,000.00) Dollars for its past and future costs. Each other party to this Consent Decree shall bear its own costs in this action and in the implementation of this Consent Decree.

XVI. SEVERABILITY

It is the intent of the parties hereto that the provisions of this Consent Decree shall be severable, and should any provision be declared by a court of competent jurisdiction to be inconsistent with State or Federal law, and therefore unenforceable, the remaining clauses shall remain in full force and effect.

XVII. RETENTION OF JURISDICTION

This Court specifically retains jurisdiction over the subject matter and the parties for the purpose of enforcing or construing or modifying the provisions of this Consent Decree.

AVERN COHN
United States District Judge

DATED AND ENTERED:

The parties agree and consent hereto.

FRANK J. KELLEY
Attorney General

STEWART H. FREEMAN
Assistant Attorney General in Charge
Environmental Protection Division

STEPHEN F. SCHUESLER
Assistant Attorney General
Environmental Protection Division
Department of Attorney General
720 Law Building
Lansing, Michigan 48913

BASF WYANDOTTE CORPORATION
a Michigan corporation, Defendant

By: Edwin L. Steingel (CEO)
Its President

and by

FISCHER, FRANKLIN, FORD, SIMON
& HOGG

By: William C. Potter, Jr.
William C. Potter, Jr.

and Thomas M. Woods
Thomas M. Woods

Attorneys for Defendant
BASF Wyandotte Corporation

1700 Guardian Building
Detroit, Michigan 48226

APPENDIX A

PROPERTY DESCRIPTION NORTH and SOUTH WORKS

NORTH WORKS

The land located in the City of Wyandotte, Wayne County, State of Michigan described as being part of fractional Sections 21 and 28, T. 3 S., R. 11 E. and generally described as being bounded on the north by Perry Place, on the east by the U.S. Harbor Line of the Detroit River, on the south by Mulberry Street and of the west by Biddle Avenue. Exhibit I, Appendix B is a generalized map of the North Works.

SOUTH WORKS

The land located in the City of Wyandotte, Wayne County, State of Michigan, described as being part of fractional Section 32, T. 3 S., R. 11 E. and generally described as being bounded on the north by Pine Street, on the east by the U.S. Harbor Line of the Detroit River, on the south by Wye Street and on the west by Biddle Avenue. Exhibit I, Appendix C is a generalized map of the South Works.

11/07/85

APPENDIX B

NORTH WORKS

REMEDIAL PROGRAM

INTRODUCTION

BWC will undertake a remedial program that addresses the movement of groundwater towards the Detroit River and the City of Wyandotte sewer system from Locations A, B and C as shown on Exhibits I through V of this appendix.

A. EXTRACTION SYSTEMS

A groundwater extraction system shall be installed in Locations A, B, and C. The approximate position of each extraction system is shown on Exhibit I. Exhibits II, III and IV provide information on the number and placement of extraction wells and piezometers for Locations A, B and C respectively. The number of wells and the rate of withdrawal from the wells for each location shall be at all times sufficient to halt the flow of contaminated groundwater to the Detroit River and the City of Wyandotte sewer system by maintaining a hydraulic gradient toward the extraction wells.

BWC shall maintain the extraction wells including cleaning, replacement of screens and replacement of any extraction well that will not produce water due to failure of well components. A piezometer system shall be installed and the water level will be measured on the schedule established in paragraph D of this appendix, to demonstrate the creation and maintenance of an inward hydraulic gradient at Locations A, B and C.

B. TREATMENT SYSTEMS

A groundwater treatment system(s) shall be installed to treat the water removed by each extraction well system pursuant to the Implementation Schedule. BWC shall maintain the treatment system(s) until the conditions for cessation of operation are met.

C. IMPLEMENTATION SCHEDULE

BWC shall complete installation of the remedial program described in this appendix on or before December 31, 1986.

BWC shall develop the basis of design of an activated carbon system, or its equivalent, construct such system and commence its operation on or before December 31, 1986. The basis of design and the final process flow diagram and operations manual shall be submitted to MDNR for review and approval which shall be completed within thirty (30) days of submittal.

D. MONITORING

Piezometers/monitor wells shall be installed in Locations A, B and C approximately as shown on Exhibits II through IV. The specific locations of the piezometers and monitor wells shall be described on as built plans.

The water level in each piezometer, and each extraction well shall be measured monthly for the first year following installation of the piezometers and quarterly thereafter. BWC shall demonstrate that an inward hydraulic gradient toward each extraction well system exists that is adequate to halt the flow of contaminated groundwater from the North Works to the Detroit River. Thereafter, the water level elevation in each piezometer shall be measured quarterly.

MONITORING (Continued)

BWC shall operate all extraction and treatment systems for a period of not less than 15 years. Following that period, BWC may give notice of intent to discontinue operation of any extraction well, extraction system or treatment system if six (6) consecutive samples collected in June and October in each of three (3) consecutive years from such well(s), extraction system, treatment system and associated monitoring well(s) demonstrate that the required concentration levels of contaminants have been achieved, or BWC can demonstrate that the concentration of the chemicals identified in the basis of design are no longer effectively being removed by the treatment system. "The required concentration levels of contaminants" means that the concentrations of contaminants identified in the basis of design of the treatment system(s) are less than the level of detectibility described in this paragraph D. If such demonstration is made, such extraction well, extraction system or treatment system may be plugged and abandoned in accordance with the procedures set forth in Paragraph VI of the Consent Decree. In any event, as of the beginning of the twenty-sixth (26th) year of the operation of the system, BWC shall commence such collection and analysis of samples from each extraction well and monitor well then in operation, which collection and analysis shall continue until the end of the thirty (30) year period provided by the Consent Decree. The samples shall be analyzed for the chemicals listed in the basis of design of the treatment system(s).

All analysis required under this Consent Decree shall use EPA Method 624 or 625 as published in the Federal Register on October 26, 1984. Concentrations shall be reported in detectable amounts based on ten (10) times signal-to-noise ratio. When using EPA Method 625, a 1000 ml water sample shall be concentrated to 2 ml of extract.

E. OPERATION OF THE SYSTEMS

Groundwater extracted and treated by the systems described in the Consent Decree, shall be discharged to the Wayne County Department of Public Works' Wastewater Treatment Plant in accordance with a permit to discharge issued by Wayne County to BWC or to the surface waters under an NPDES permit issued by the State to BWC.

F. OTHER CONDITIONS

Within thirty (30) days of the receipt of any influent or effluent data required under this remedial program, BWC shall provide the Department of Natural Resources with the numerical results.

BWC will provide thirty (30) days prior written notice to the Wayne County Public Works of its intent to discontinue the sampling of any groundwater source discharging to the Wayne County Public Works' Wastewater Treatment Plant.

BWC shall make application to discharge the groundwater collected from these remedial systems to the Wayne County Public Works' Wastewater Treatment Plant. In the event the characteristics of the groundwater require Wayne County to impose pretreatment as a condition precedent to discharge, BWC may elect to comply with the County's pretreatment requirements or, alternatively, BWC may make application for direct discharge to the Detroit River. In the event Wayne County is required to reject the groundwater discharge from any of the above systems, BWC shall make application for the direct discharge of such groundwater

OTHER CONDITIONS (Continued)

to the Detroit River. Should BWC make application for a permit to discharge groundwater to the Detroit River, the Michigan Department of Natural Resources shall review the application in accordance with then applicable regulations and shall not unreasonably deny the permit. Provided BWC (a) gives notice to MDNR within five (5) working days of receipt of notice by the County of its intent to reject BWC's discharge, (b) applies for a permit for direct discharge to the Detroit River within sixty (60) days following receipt of such notice by the County, and (c) takes all reasonable steps necessary to maintain a permitted discharge to the POTW during the period following the County's adoption of the pretreatment requirements, the groundwater collection systems shall not be operated unless a permit to discharge to Wayne County or, alternatively, to the Detroit River, has been issued and remains in effect. If BWC challenges the necessity for or the validity of any permit condition, BWC shall construct, maintain and operate treatment technology which has been agreed upon by the parties or which has been determined to be appropriate by this Court under Paragraph VII.C. of the Consent Decree until such challenge(s) has been resolved.

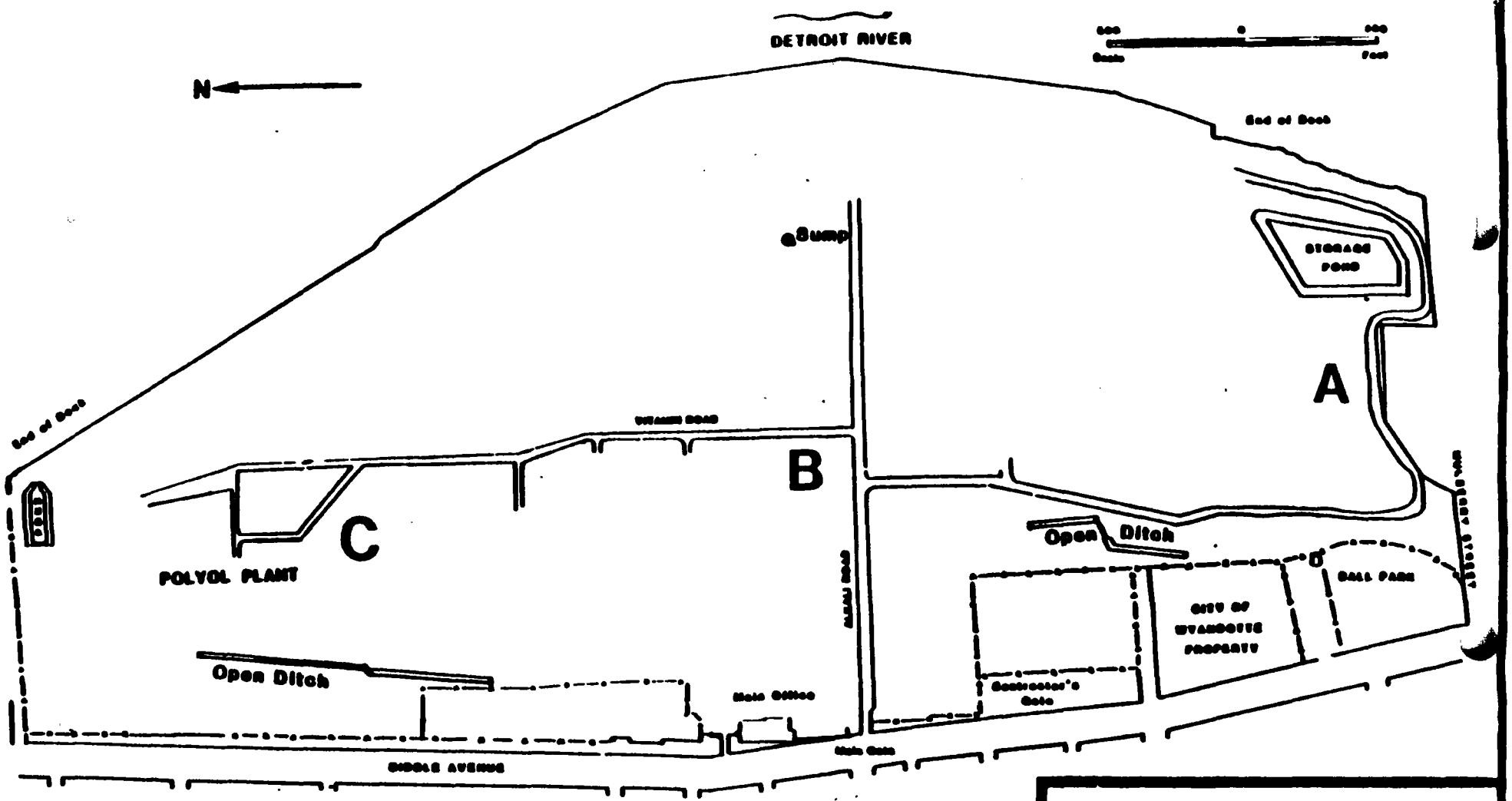
Upon application by BWC at any time after a fifteen (15) year period, the Department of Natural Resources shall determine whether the operation of any of the above systems or parts thereof is no longer necessary to comply with conditions established by then existing law or regulations. If the operation of such system(s) is not required, it may be discontinued. BWC shall bear the bur-

OTHER CONDITIONS (Continued)

den of persuasion by a preponderance of the evidence that continued operation of the system(s) is no longer necessary.

All former observation wells will be plugged.

Soils and sludges excavated during construction of any groundwater collection system shall be managed in accordance with the law.



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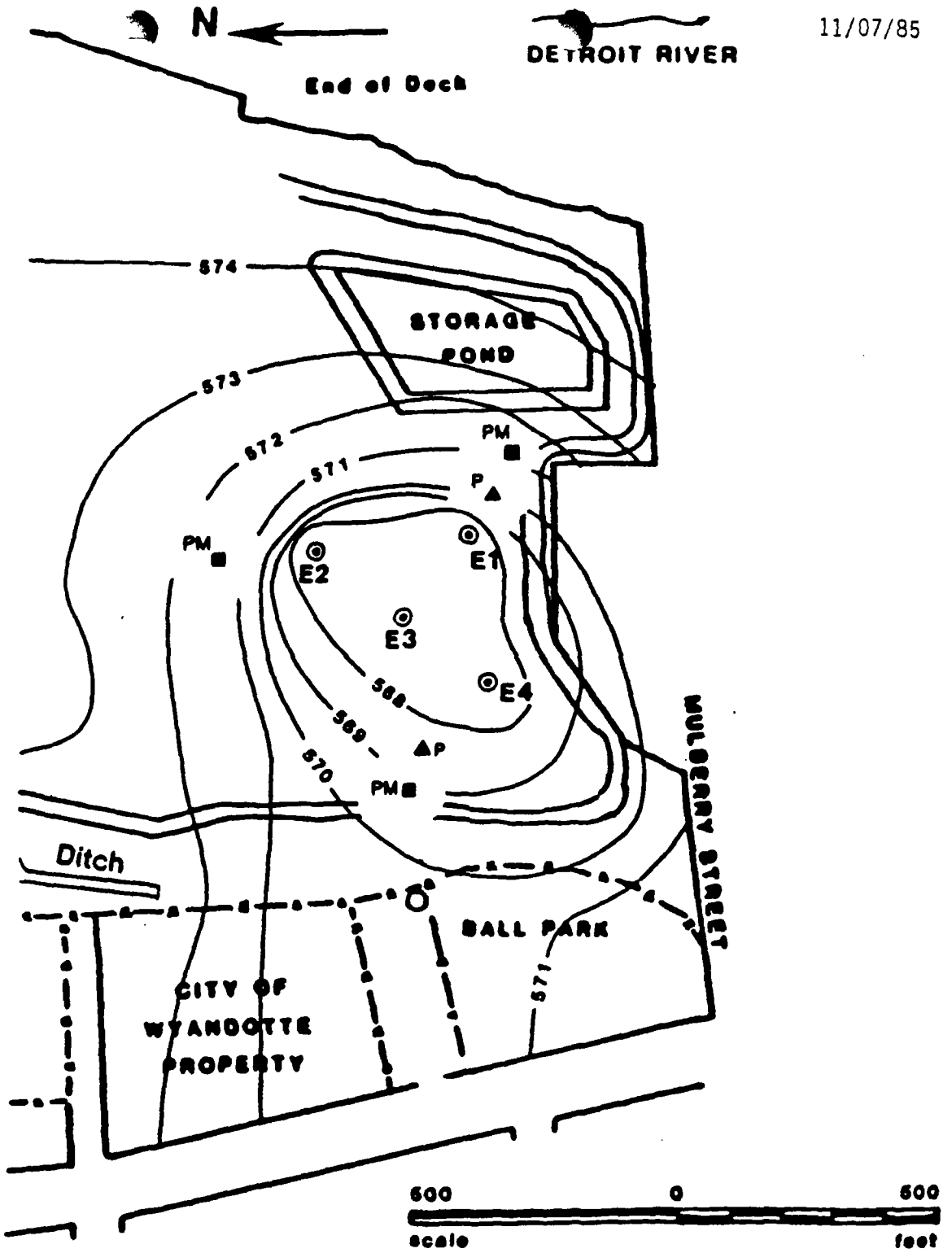
NORTH WORKS

EXHIBIT I

LOCATIONS

11/07/85



LEGEND

- ⊙ - EXTRACTION WELL
- ▲ P - PIEZOMETER
- ■ PM - PIEZOMETER/MONITOR WELL
- -570- - CONTOUR ON PREDICTED WATER TABLE IN FEET (USO & GSD)

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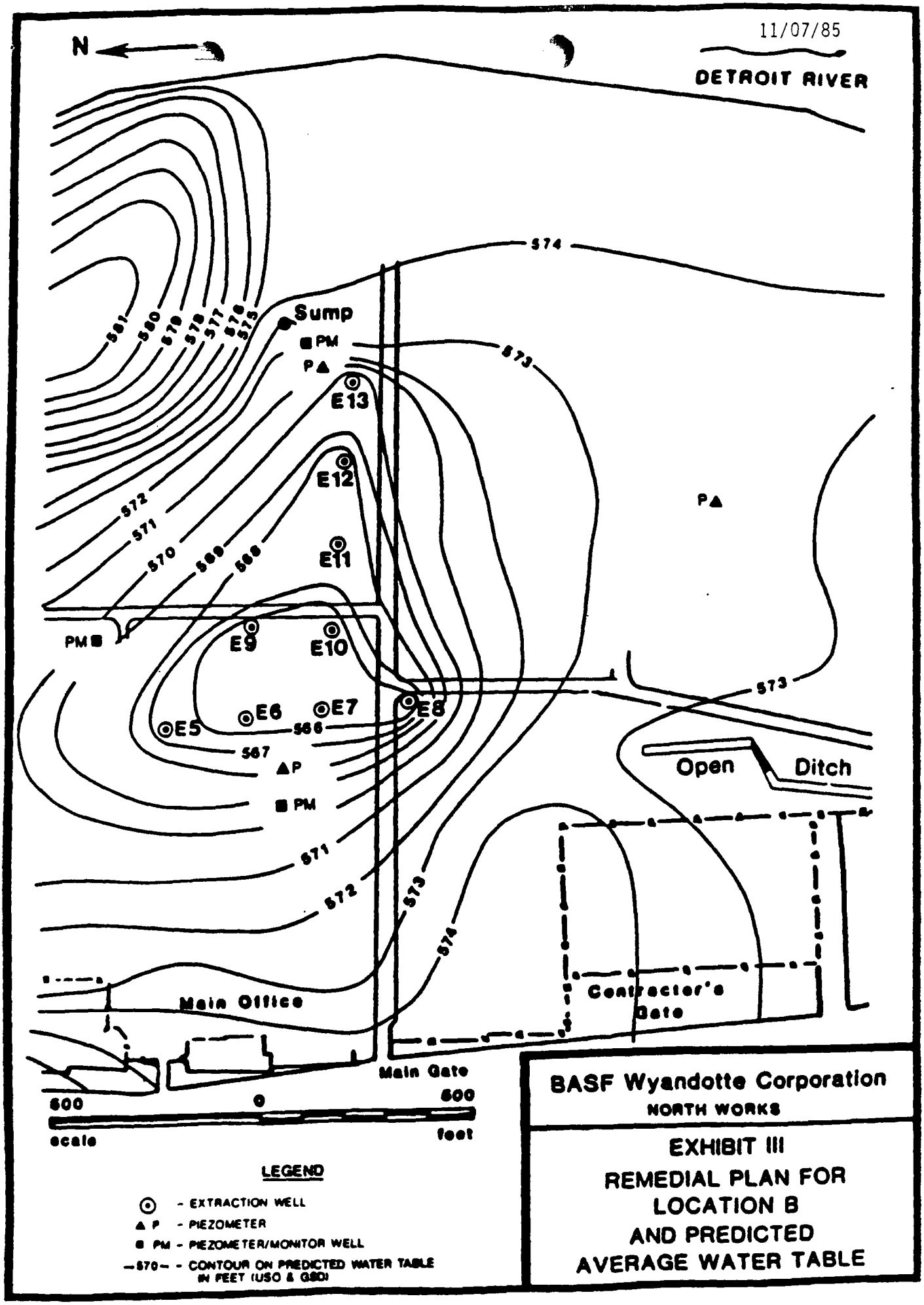
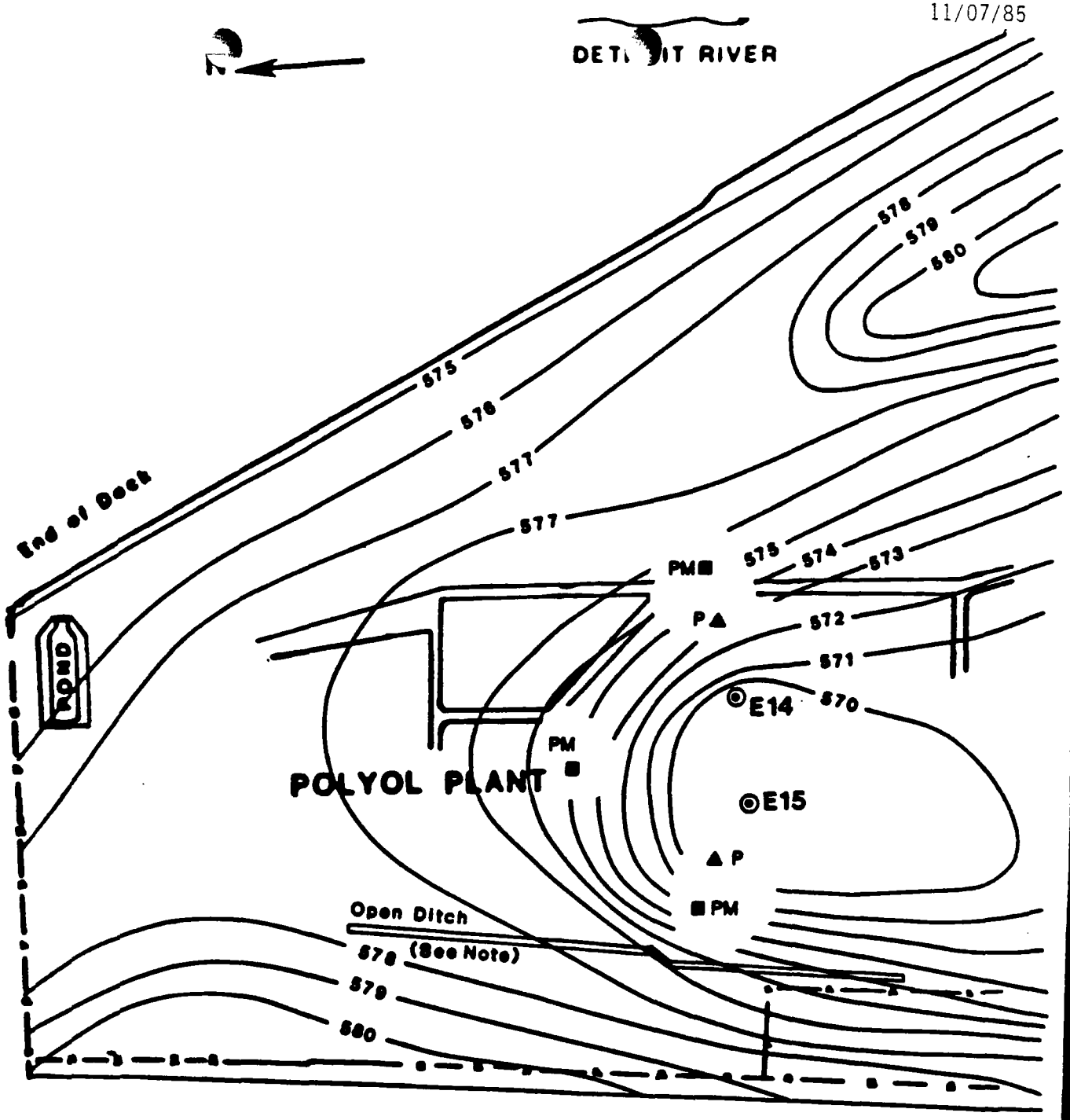
EXHIBIT II
REMEDIAL PLAN FOR LOCATION A AND PREDICTED AVERAGE WATER TABLE


11/07/85
N
DETROIT RIVER
574
573
572
571
570
569
568
567
566
581
580
579
578
577
576
575
Sump
PM
P
E13
E12
E11
E10
E9
E8
E7
E6
E5
Open Ditch
Main Office
Main Gate
Contractor's Gate
500
0
500
scale
feet
LEGEND
⊙ - EXTRACTION WELL
▲ P - PIEZOMETER
■ PM - PIEZOMETER/MONITOR WELL
—570— - CONTOUR ON PREDICTED WATER TABLE IN FEET (USO & GSD)
BASF Wyandotte Corporation
NORTH WORKS
EXHIBIT III
REMEDIAL PLAN FOR
LOCATION B
AND PREDICTED
AVERAGE WATER TABLE

11/07/85



NOTE: Most ground-water discharge into ditch eliminated during system operation.

500 0 500
scale feet

LEGEND

- ⊙ - EXTRACTION WELL
- ▲ P - PIEZOMETER
- ■ PM - PIEZOMETER/MONITOR WELL
- —570— - CONTOUR ON PREDICTED WATER TABLE IN FEET (USO & GSD)

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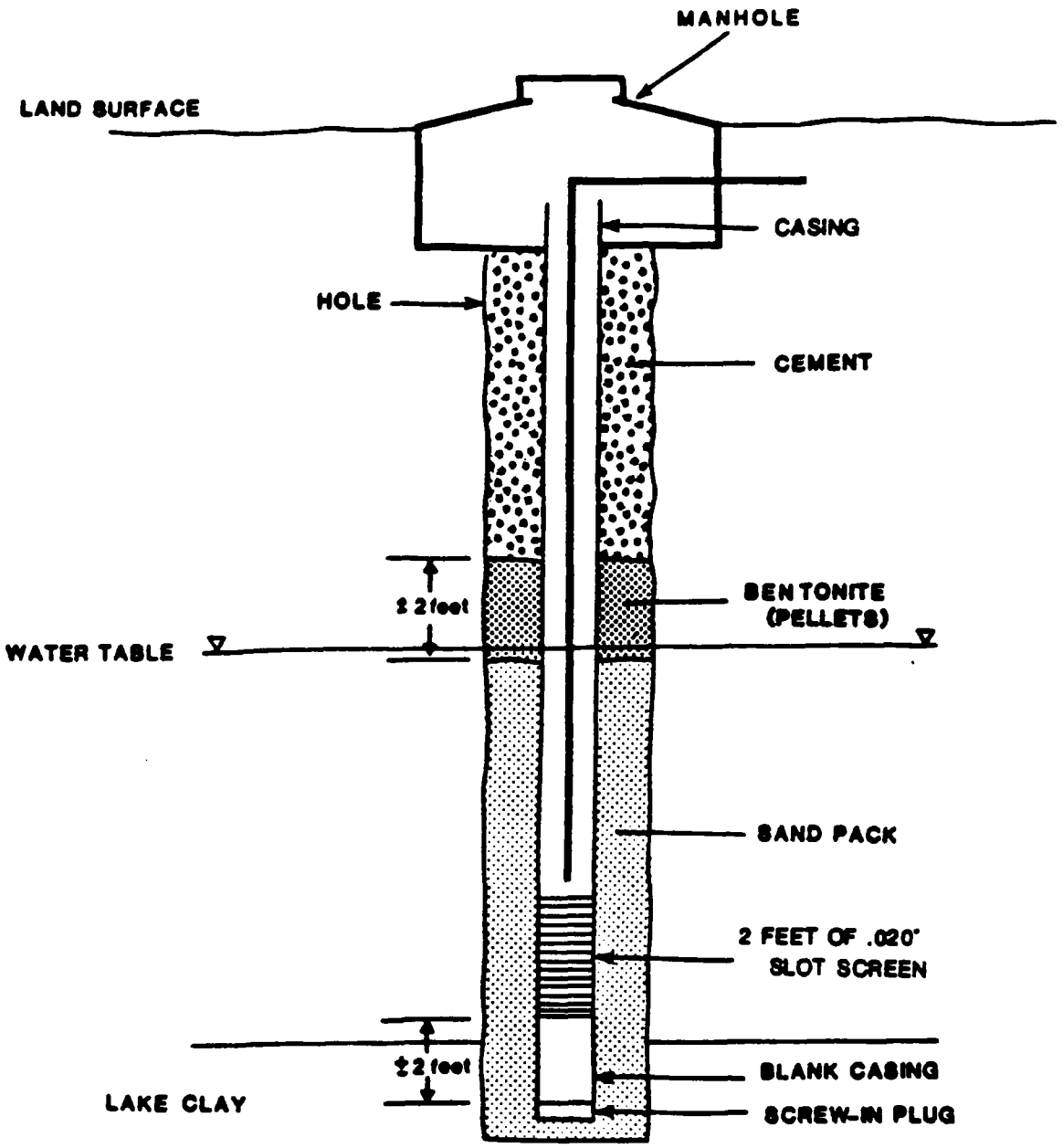
NORTH WORKS

EXHIBIT IV
REMEDIAL PLAN FOR LOCATION C AND PREDICTED AVERAGE WATER TABLE

11/07/85



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NORTH WORKS

EXHIBIT V
CONSTRUCTION DETAILS OF EXTRACTION WELLS

APPENDIX C

SOUTH WORKS

REMEDIAL PROGRAM

INTRODUCTION

BWC will undertake a remedial program for the South Works that addresses: the movement of groundwater towards the Detroit River in Area A and Area B; the presence of materials of concern in a deposit of gray solids in Area C; the tendency of water to pond in the surface in Area C; and the movement of groundwater toward Biddle Avenue in Area D.

A. REMEDIAL PROGRAM FOR AREA A

Area A is located in the southeast corner of the South Works adjacent to the Detroit River (Exhibit I).

The groundwater in this area of the site flows in the general direction of the Southeastern boundary of the site (Exhibit II). A subsurface drain system will be installed along a 400 foot north-south line located 200 feet west of the shoreline which shall halt the flow of groundwater moving from Area A toward the Detroit River and Wye Street. The location and design details of the system to be installed are set forth in the Exhibits III, IV, and V. The drain will be installed at a depth of about 15 feet near the top of the lake clay underlying the surficial materials in this area. A water level measuring device with an accuracy of $\pm$ 0.1 feet shall be installed in the sump.

Groundwater collected through the operation of this system will be discharged to the Wayne County Public Works' Wastewater Treatment Plant in accordance with a discharge permit issued by Wayne County to BWC. Groundwater will be collected and analyzed from the system during June and October of each year the system is in operation and analyzed for 1,2-dichloropropane, tetrachloroethylene and hexachlorobenzene.

B. REMEDIAL PROGRAM FOR THE AREA B

Area B lies along the river front north of Area A (Exhibit I).

Groundwater extraction wells will be installed as shown on Exhibit III on 200 ± 50 foot centers 225 ± 25 feet landward from the face of the dock on the Detroit River. The construction details for the extraction wells are shown in Exhibit VI of this appendix. The number of wells and the rate of withdrawal of water therefrom shall at all times be sufficient to halt the flow of contaminated groundwater from Area B to the Detroit River by maintaining the groundwater level in each extraction well at elevation 568 feet or lower. Samples will be collected from the combined flow of all extraction wells in June and October of each year the system is in operation and analyzed for carbon tetrachloride.

The MDNR may designate two (2) extraction wells in the system to be maintained as monitor wells.

BWC shall maintain the extraction wells including cleaning, replacement of screens and replacement of any extraction well that will not produce water due to failure of well components. Water removed by the extraction wells shall be discharged to the Wayne County Department of Public Works' Wastewater Treatment Plant in accordance with a discharge permit issued by Wayne County to BWC. A piezometer system shall be installed and water level will be measured on the schedule established in paragraph F of this appendix, to establish the long term pumping rate for each extraction well.

C. REMEDIAL PROGRAM IN AREA C

Area C is located in the northern third of the site as shown in Exhibit I. BWC shall install an extraction well system as shown in Exhibit VII. The number of wells and the rate of withdrawal of water therefrom shall at all times be sufficient to halt the flow of contaminated groundwater from leaving Area C and to maximize the pore displacement of the system by maintaining the groundwater level at elevation no higher than 563 feet at Extraction Well No. 5 as shown on Exhibit VIII of this appendix. The water from the extraction well system will discharge via a piping system to the Wayne County Department of Public Works' Wastewater Treatment Plant in accordance with a discharge permit issued by Wayne County to BWC. The construction details are shown in Exhibits VIII and IX.

Samples will be collected and analyzed from the combined flow from all extraction wells in June and October each year the system is in operation for hexachlorobenzene, hexachlorobutadiene and trichloroethylene.

The remedial program for this area will include grading and filling as necessary to eliminate standing water.

D. REMEDIAL PROGRAM FOR AREA D

Area D is located on the western edge of the South Works along Biddle Avenue, as shown on Exhibit I of this appendix.

The groundwater in this area of the site flows to the west in the general direction of Biddle Avenue (Exhibit II). A subsurface drain system will be installed

REMEDIAL PROGRAM IN AREA D (Continued)

which shall collect the groundwater in Area D and discharge the water collected to the Wayne County Department of Public Works' Wastewater Treatment Plant in accordance with a discharge permit issued by Wayne County to BWC. The location and design details of this drainage system are set forth in Exhibits V and X. A system shall be installed to measure the water level at or near the point of discharge.

Groundwater samples will be collected and analyzed from this system in June and October of each year that the drainage system is in operation for 1,2 dichloropropane, trichloroethylene, and tetrachloroethylene.

A system of three (3) piezometers will be installed in the vicinity of Area D to demonstrate that the slope of the groundwater table is in the direction of the drainage system described above. In the event the building foundations are removed or found not to represent a barrier to the movement of groundwater toward Biddle Avenue during the agreed upon period of operation of the drainage system, the drainage system shall be extended as needed to collect groundwater from Area D.

E. IMPLEMENTATION SCHEDULE

BWC shall complete installation of the remedial program for the South Works on or before December 31, 1986.

F. MONITORING

1. PURPOSE OF MONITORING

The purpose of the water level and water quality monitoring provisions is to determine whether the remedial systems are meeting the requirements of this Consent Decree.

2. WATER LEVELS

Piezometers, extraction wells and monitor wells shall be installed in Areas A and B at the approximate locations shown in Exhibit III by December 31, 1986.

The water level in each piezometer and each extraction well in Areas A, B and D shall be measured monthly for the first year following installation of the piezometers and quarterly thereafter until a demonstration has been made that the collection systems have halted the flow of contaminated groundwater from these areas. Once this demonstration has been made and reported to the MDNR, no further water level measurements will be required and the piezometers may be plugged unless MDNR, for good cause shown, can demonstrate a need for continuation of the water level measurements within sixty (60) days of receipt of the report.

WATER LEVELS (Continued)

The piezometer system required under the program for Area D shall be installed and the required water level measurements will commence within one (1) year after completion of the collection system. The water level shall be measured monthly in each piezometer and in monitor wells MW-3, MW-4, and MW-5 for one (1) year and quarterly thereafter until a demonstration has been made that the flow of contaminated groundwater to the Detroit River has been halted. Once this demonstration has been made and reported to the MDNR, no further water level measurements will be required and the piezometers may be plugged unless MDNR, within sixty (60) days of receipt of the report, can demonstrate a need for continuation of the water level measurements.

3. WATER QUALITY

BWC shall operate all extraction systems for a period of not less than fifteen (15) years. Following that period, BWC may give notice of intent to discontinue operation of any single well and/or extraction system if six (6) consecutive samples collected from such well(s), extraction system, treatment system and associated monitoring well(s) in June and October of each of three (3) consecutive years demonstrates that the concentrations of the chemicals listed in Table I below are less than ten (10) times signal-to-noise using EPA Method 624 or 625. All analysis using EPA Method 625 shall be based on a 1000 ml sample concentrated to 2 ml of extract.

WATER QUALITY (Continued)

TABLE I

Parameter	Remedial Area A	B	C	D
1,2-Dichloropropane	X			X
Tetrachloroethylene	X			
Hexachlorobenzene	X		X	X
Carbon tetrachloride		X		
Hexachlorobutadiene			X	
Trichloroethylene			X	X

*All monitor wells shall be analyzed for chloroform during the above monitoring for the appropriate area(s).

If concentration levels for the appropriate area(s) are achieved, operation of the extraction well or extraction system(s) may be discontinued in accordance with the procedures set forth in Paragraph VI of the Consent Decree.

In any event, in June and October of each year beginning with the twenty-fifth (25th) year of the operation of the system on the South Works, BWC shall collect and analyze samples from each extraction well and monitor well then in operation, which collection and analysis shall continue until the end of the thirty (30) year period provided by the Consent Decree.

G. OTHER CONDITIONS

Within thirty (30) days of the receipt of any groundwater data under this remedial program, BWC shall provide the Department of Natural Resources with the numerical results.

BWC will provide thirty (30) days prior written notice to the Wayne County Public Works of its intent to discontinue the sampling of any groundwater source discharging to the Wayne County Public Works' Wastewater Treatment Plant.

OTHER CONDITIONS (Continued)

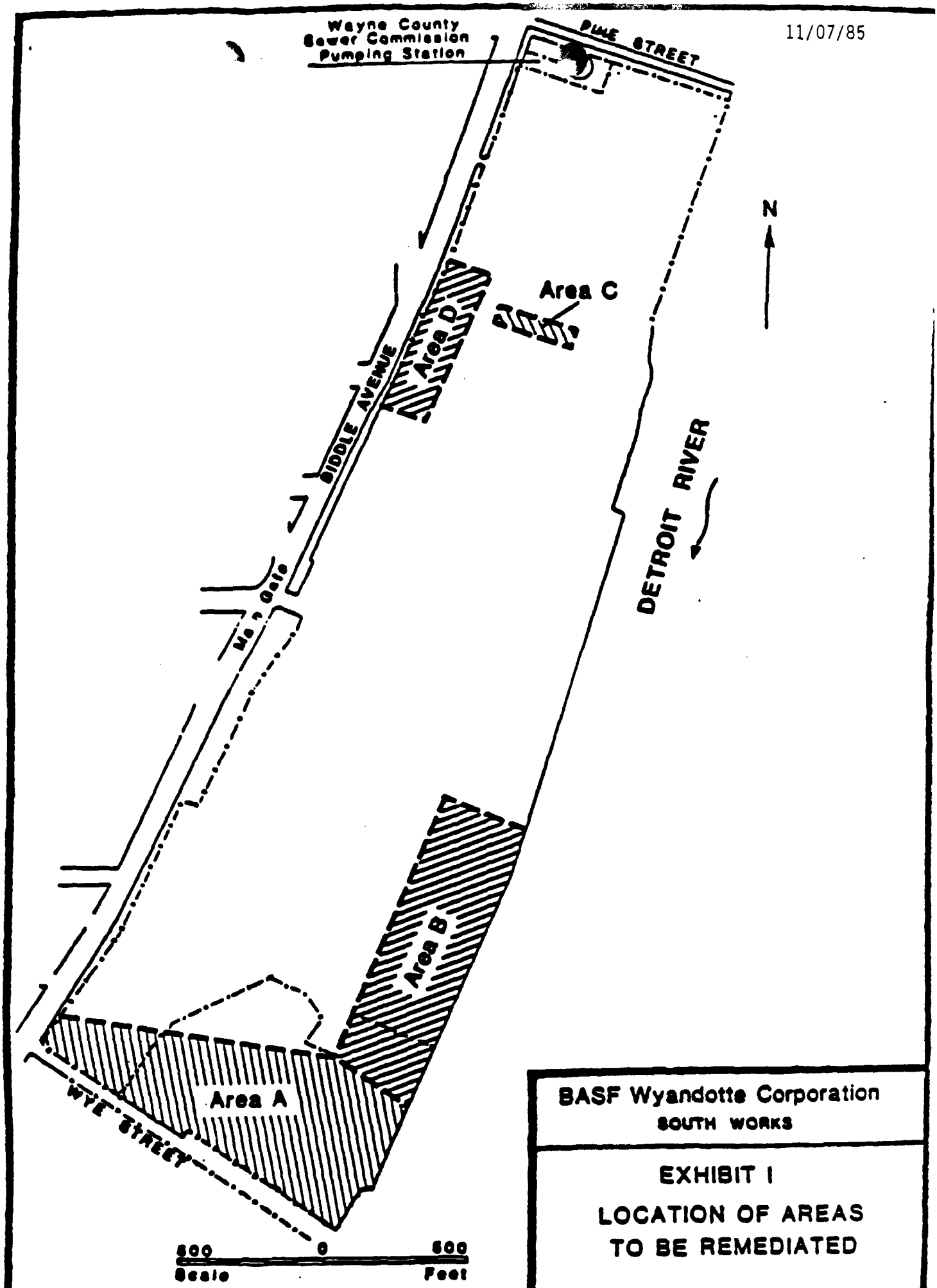
BWC shall make application to discharge the groundwater collected from these remedial systems to the Wayne County Public Works' Wastewater Treatment Plant. In the event the characteristics of the groundwater require Wayne County to impose pretreatment as a condition precedent to discharge, BWC may elect to comply with the County's pretreatment requirements or, alternatively, BWC may make application for direct discharge to the Detroit River. In the event Wayne County is required to reject the groundwater discharge from any of the above systems, BWC shall make application for the direct discharge of such groundwater to the Detroit River. Should BWC make application for a permit to discharge groundwater to the Detroit River, the Michigan Department of Natural Resources shall review the application in accordance with then applicable regulations and shall not unreasonably deny the permit. Provided BWC (a) gives notice to MDNR within five (5) working days of receipt of notice by the County of its intent to reject BWC's discharge, (b) applies for a permit for direct discharge to the Detroit River within sixty (60) days following receipt of such notice by the County, and (c) takes all reasonable steps necessary to maintain a permitted discharge to the POTW during the period following the County's adoption of the pretreatment requirements, the groundwater collection systems shall not be operated unless a permit to discharge to Wayne County or, alternatively, to the Detroit River, has been issued and remains in effect. If BWC challenges the necessity for or the validity of any permit condition, BWC shall construct, maintain and operate treatment technology which has been agreed upon by the parties or which has been determined to be appropriate by this Court under Paragraph VII.C. of the Consent Decree until such challenge(s) has been resolved.

OTHER CONDITIONS (Continued)

Upon application by BWC at any time after a fifteen (15) year period, the Department of Natural Resources shall determine whether the operation of any of the above systems is no longer necessary to comply with conditions established by then existing law or regulations. If the operation of such systems(s) is not required, it may be discontinued. BWC shall bear the burden of persuasion by a preponderance of the evidence that continued operation of the system(s) is no longer necessary.

Soils and sludges excavated during construction of any groundwater collection system shall be managed in accordance with the law.

11/07/85

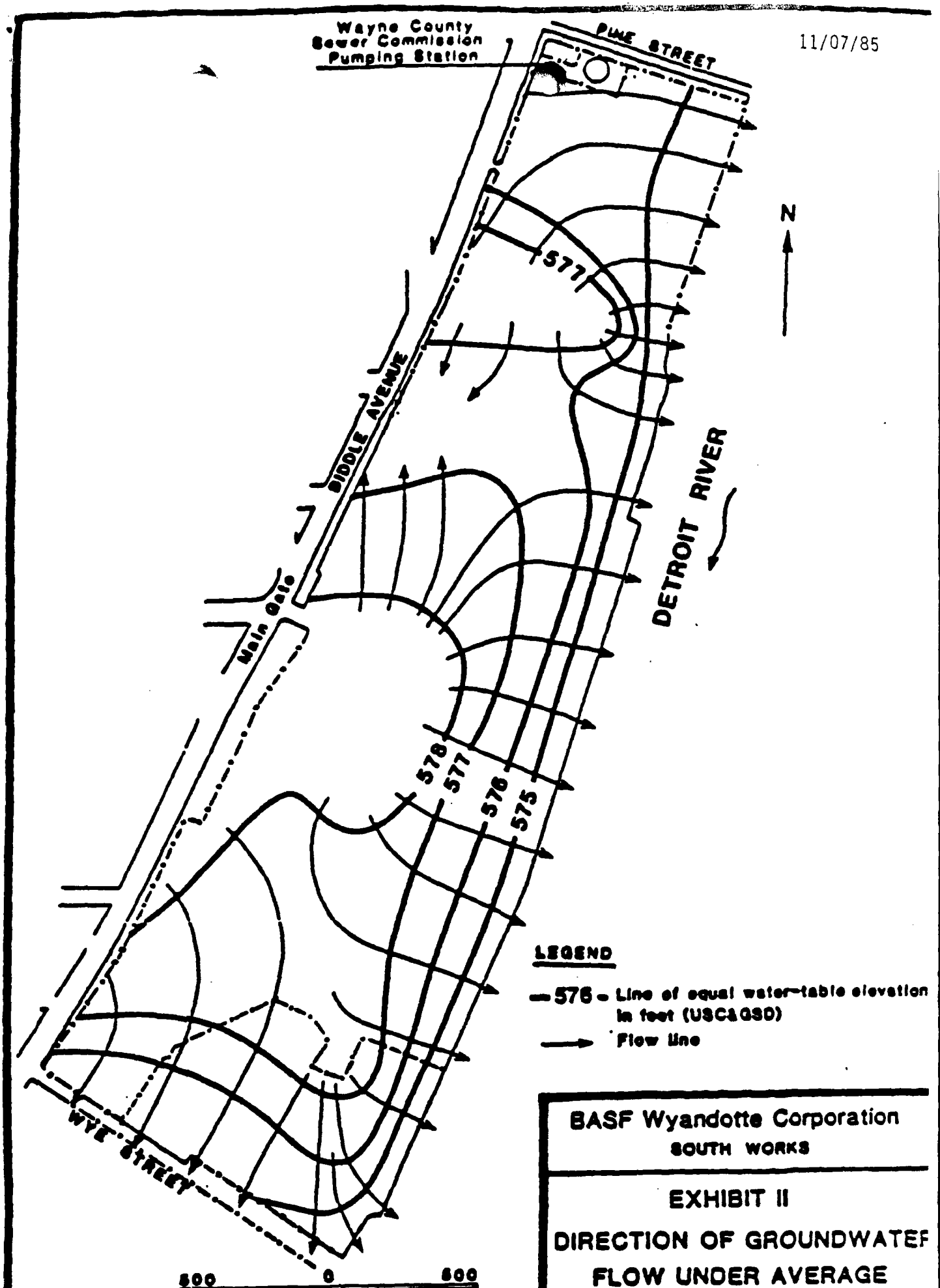


BASF Wyandotte Corporation
SOUTH WORKS

EXHIBIT I

LOCATION OF AREAS
TO BE REMEDIATED

11/07/85

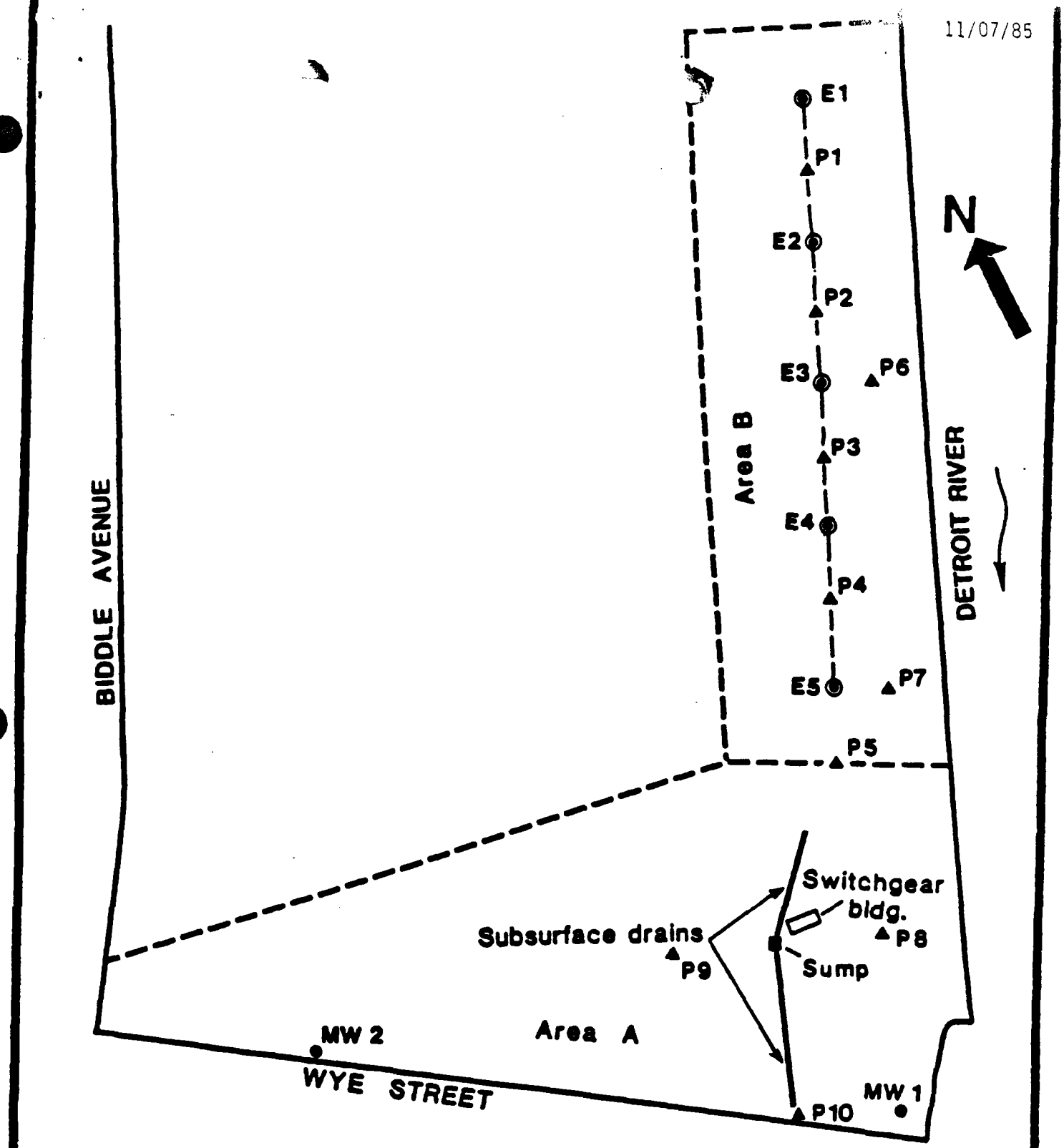


BASF Wyandotte Corporation
SOUTH WORKS

EXHIBIT II

DIRECTION OF GROUNDWATER FLOW UNDER AVERAGE WATER-TABLE ELEVATIONS

11/07/85



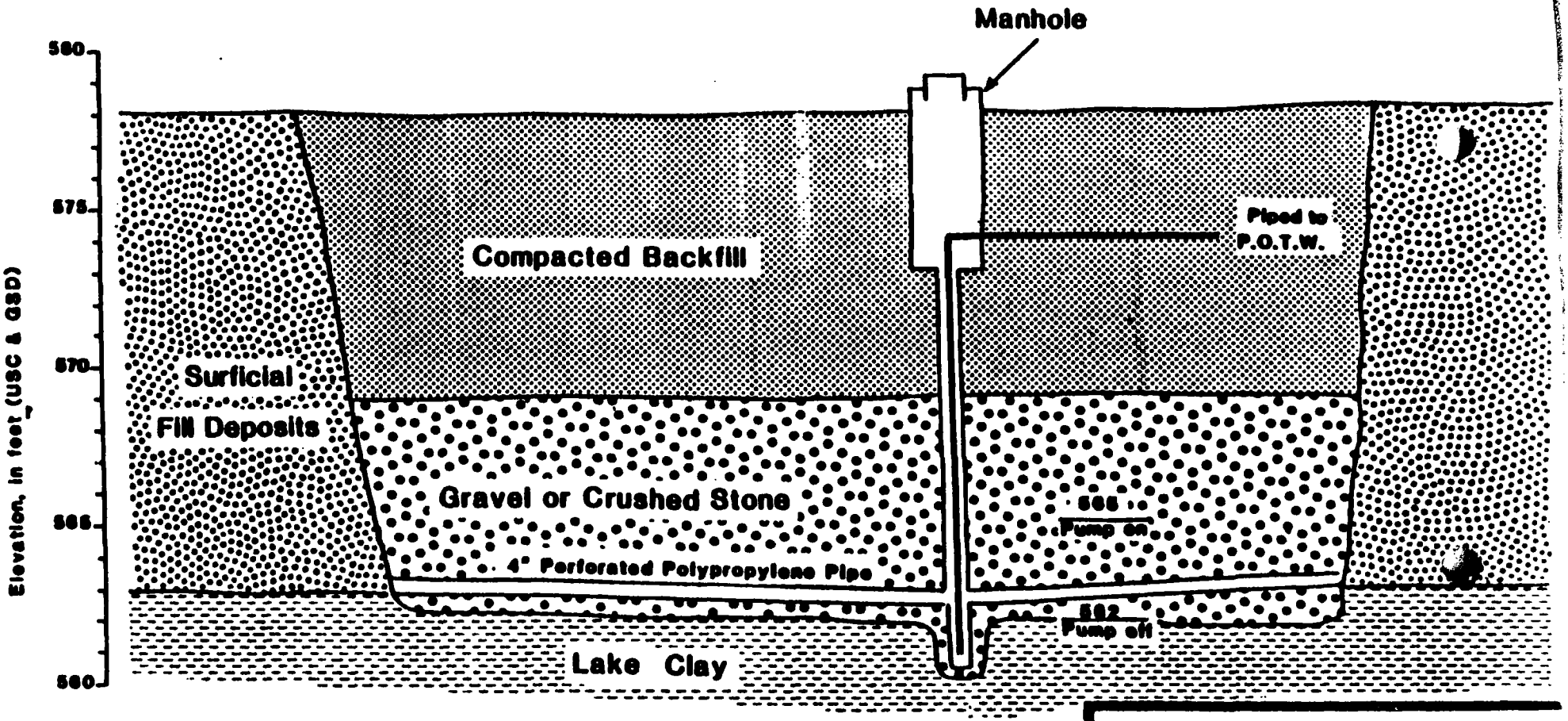
LEGEND

MW 1 ● Monitoring well
E1 ◉ Extraction well
P1 ▲ Piezometer

200 0 200
scale feet

BASF Wyandotte Corporation
SOUTH WORKS

EXHIBIT III
REMEDIAL PLAN FOR
AREAS A AND B



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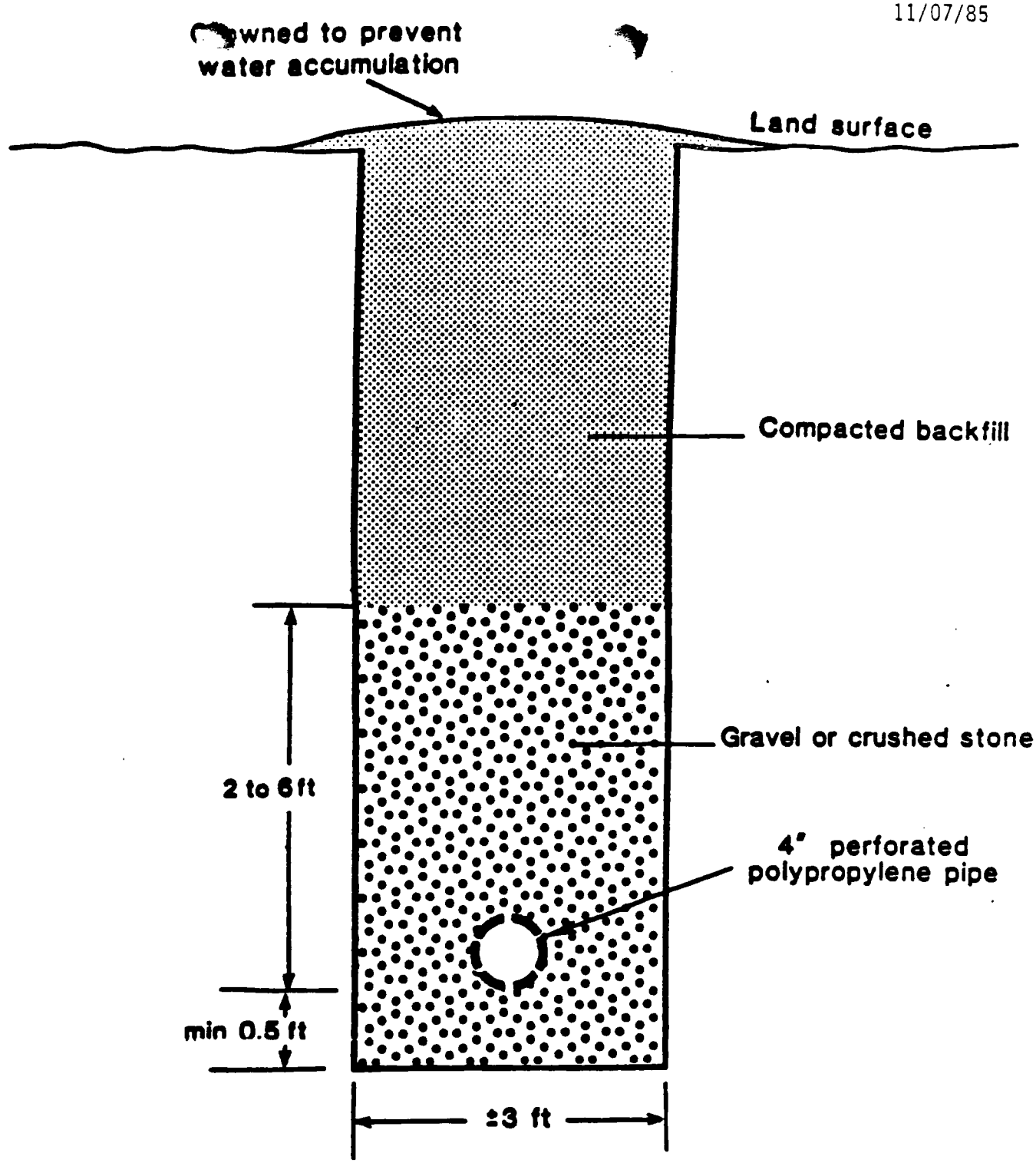
SOUTH WORKS

EXHIBIT IV
PROFILE ALONG
DRAINS – AREA A

11/07/85

11/07/85

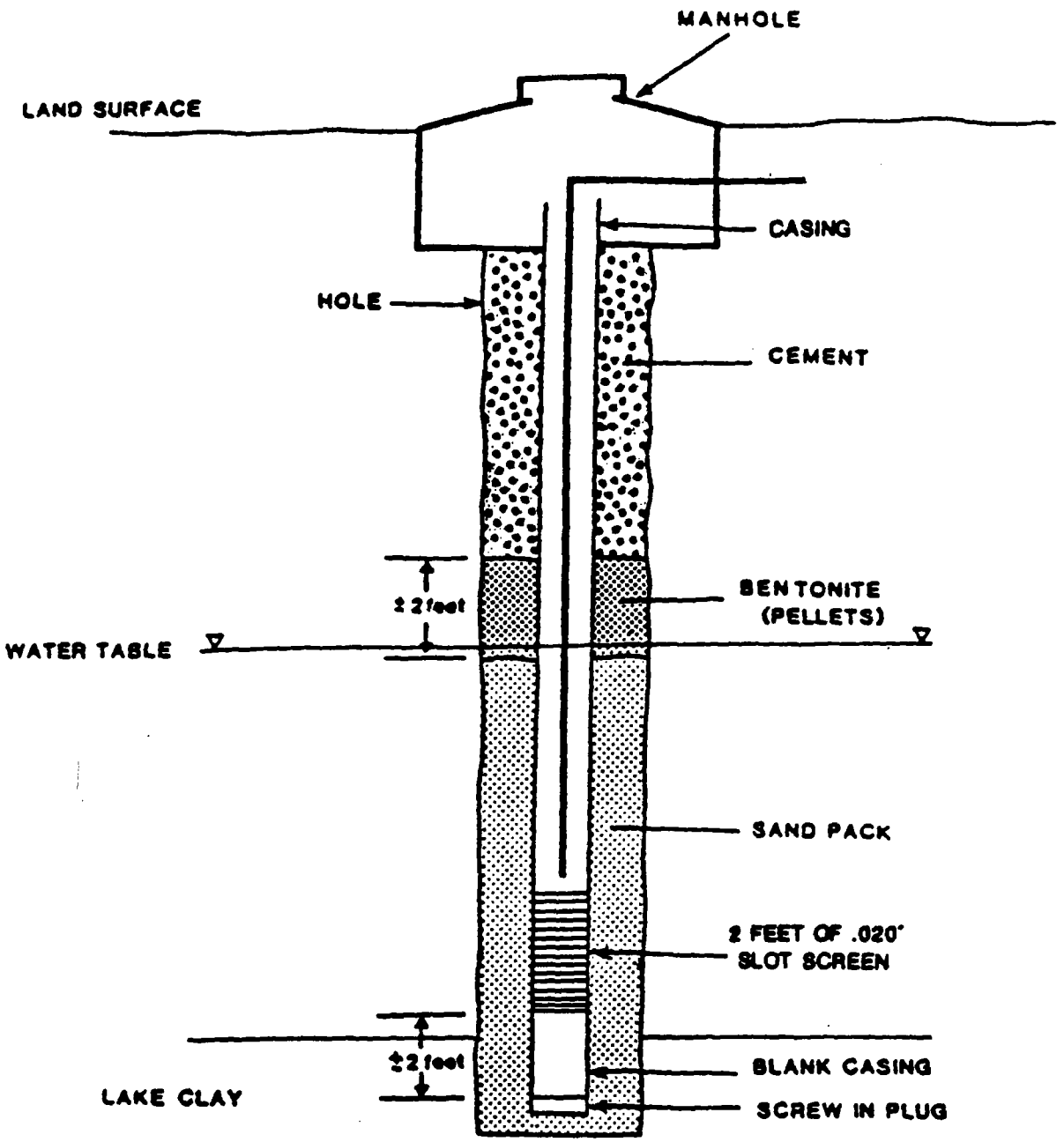


NOT TO SCALE

BASF Wyandotte Corporation
SOUTH WORKS

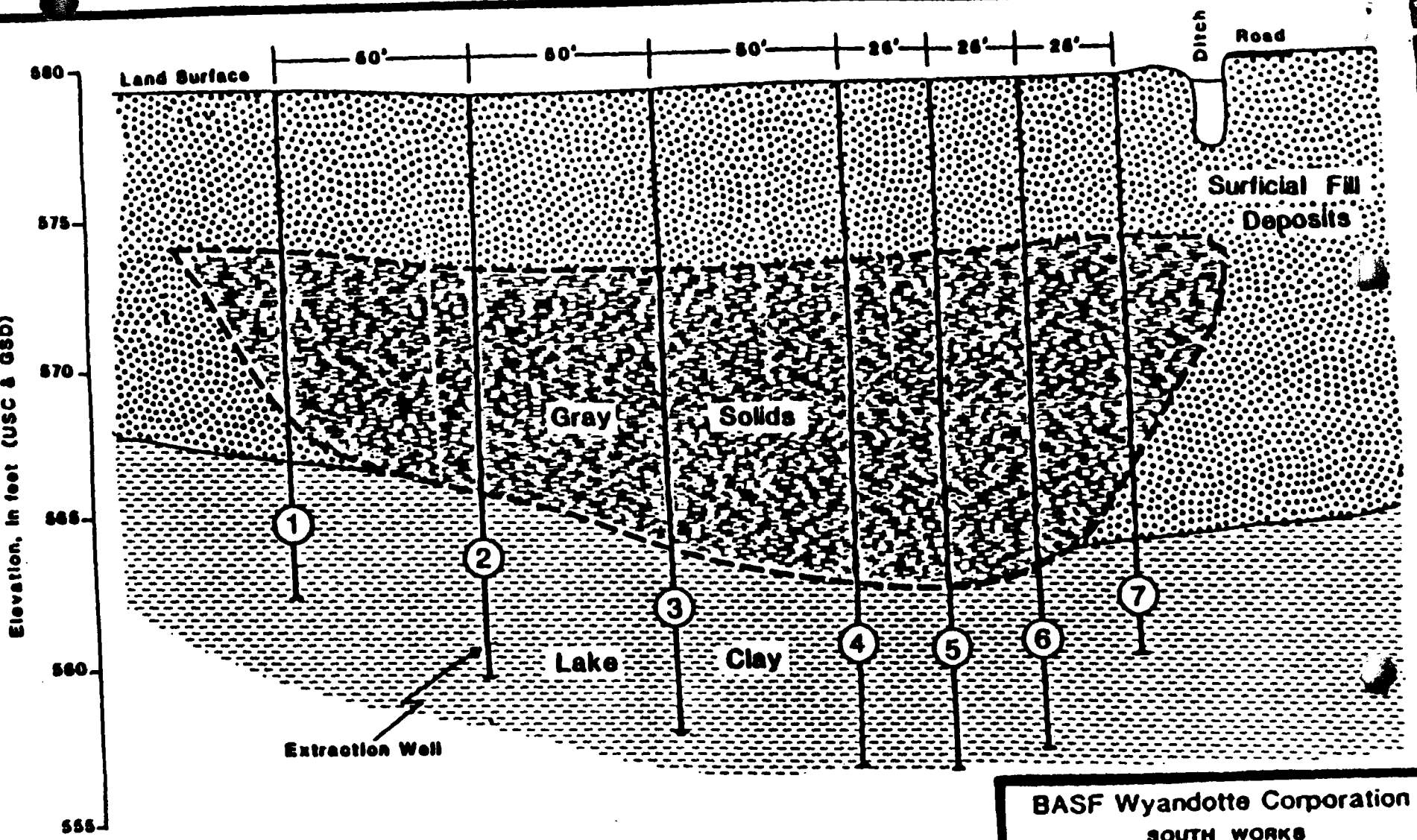
EXHIBIT V
SCHEMATIC DIAGRAM
OF TYPICAL
DRAIN CONSTRUCTION

11/07/85



BASF Wyandotte Corporation
SOUTH WORKS

EXHIBIT VI
CONSTRUCTION DETAILS
OF EXTRACTION WELLS
AREA B



NOTE : See Exhibit IX for extraction well construction details.

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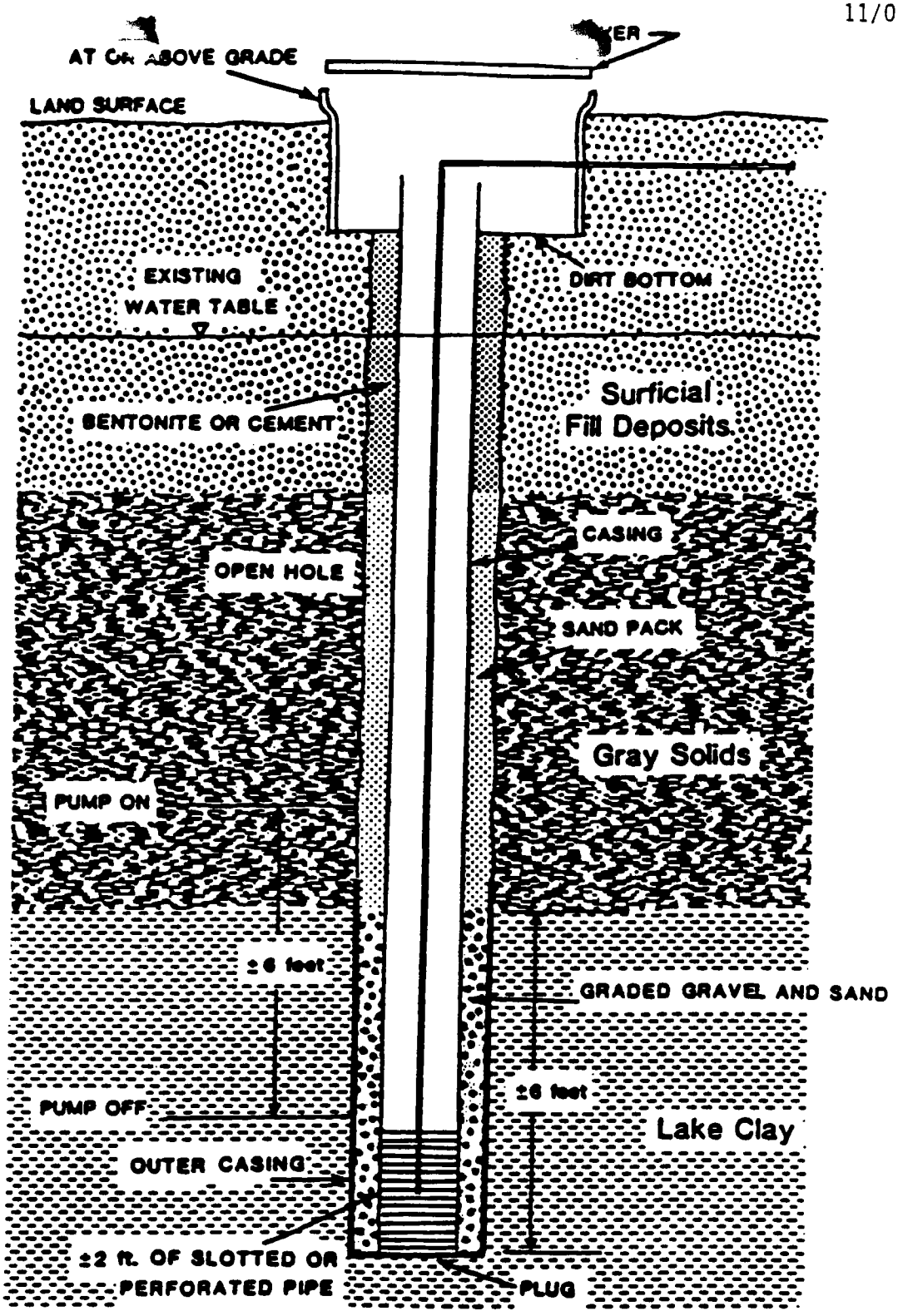
SOUTH WORKS

EXHIBIT VIII
PROFILE ALONG LINE
OF WELLS-AREA C

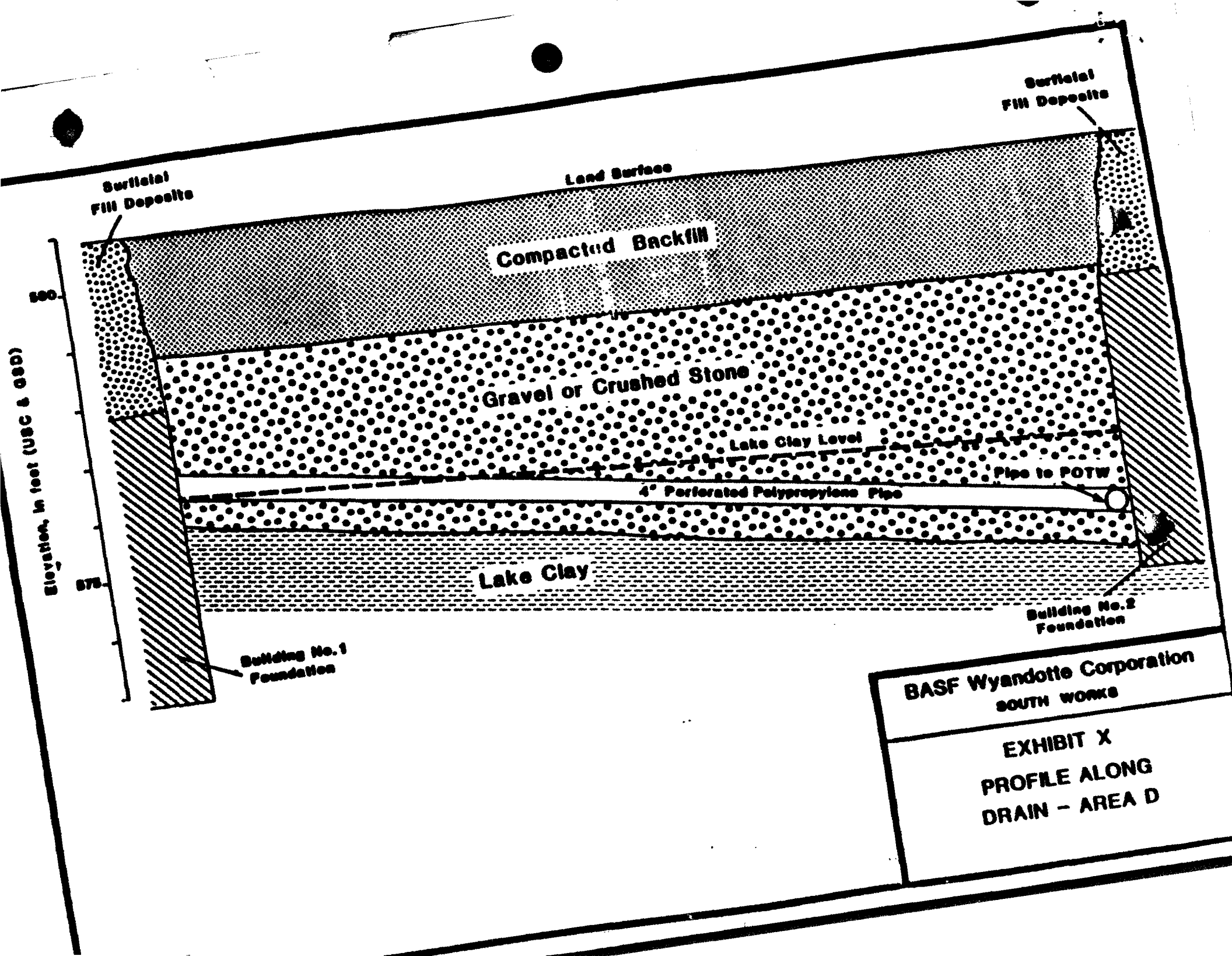
11/07/85

11/07/85



BASF Wyandotte Corporation
SOUTH WORKS

EXHIBIT IX
CONSTRUCTION DETAILS
OF EXTRACTION WELLS
AREA C


Surficial Fill Deposits
Land Surface
Surficial Fill Deposits
Compacted Backfill
Gravel or Crushed Stone
Lake Clay Level
Pipe to POTW
4" Perforated Polypropylene Pipe
Lake Clay
Elevation, in feet (USC & GSD)
590
575
Building No.1 Foundation
Building No.2 Foundation
BASF Wyandotte Corporation
SOUTH WORKS
EXHIBIT X
PROFILE ALONG
DRAIN - AREA D